


SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH



SCOR
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INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

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INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

**PROCEEDINGS
OF THE
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH**

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PROCEEDINGS
of the
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

Report of the 14th Executive Committee Meeting
London, 17-20 March 1970

The meeting of the SCOR Executive Committee was held at the Royal Society in London, 17-20 March 1970, with the President, Professor Wooster, in the chair. Local arrangements were made by Mr. G.E. Hemmen on behalf of the British National Committee and the Royal Society. The President of the Royal Society, Lord Blackett, welcomed participants at a reception in the new quarters of the Society. On 19 March, participants visited the National Institute of Oceanography at Wormley where Dr. G.E.R. Deacon and members of his staff presented information on scientific work in progress.

A list of those who attended the meeting is given in Annex I. The agenda of the meeting serves as an outline for the report which follows.

1.0 ORGANIZATION AND FINANCE

1.1 MEMBERSHIP

No changes in membership have been reported since the last meeting. Present membership is given on the inside front cover of the Proceedings; addresses of national committees are given in Annex III.

There was further discussion on the desirability of increasing SCOR membership. On the one hand, scientists from a large percentage of the countries most extensively involved in oceanic research are already represented on SCOR. On the other hand, the nature of SCOR's advisory relationship with UNESCO and IOC makes it desirable that the Committee be broadly representative of marine scientists working in all regions of the world ocean. It seems likely that the proposed changes in the composition and functions of SCOR (see item 4.1) to be discussed in Tokyo may serve to increase interest in supporting and participating in SCOR activities.

The Retiring President, Captain Capurro, submitted the draft of a brief history of SCOR for inclusion in the proposed brochure on the purpose, functions and accomplishments of the Committee. It was agreed that the brochure should be available at the Tokyo meeting. Similar information on the other non-governmental organizations concerned with that meeting would facilitate discussion of improved arrangements for marine science within ICSU.

1.2 PUBLICATIONS

The report of the 13th Executive Meeting (Göteborg and Paris, 26-29 August 1969) was published in Proceedings, vol. 5, no. 2, which was distributed in December. Announcements and abstracts of the reports of Working Groups 15 and 21 (published by UNESCO in the series Technical Papers in Marine Science) have been published by Deep-Sea Research, accepted by Cahiers Oceanographiques and also were submitted for publication in Okeanologiya.

Papers presented at the SCOR Symposium "Scientific Exploration of the South Pacific" (La Jolla, June 1968) are being published by the U.S. National Academy of Sciences; proofs have recently been distributed and publication is anticipated during the summer. The symposium volume on micropaleontology of marine bottom sediments is scheduled for publication by the Cambridge University Press. Papers presented at the WG 31 symposium on East Atlantic Continental Margins (Cambridge, 23-26 March 1970) will be published by the Institute for Geological Sciences (U.K.).

In considering the possible publication of Tokyo symposia (see item 5.2), the general utility and practicability of such publications was discussed. When publication is justified, on the basis of scientific quality and interest, it is desirable to use regular and established series whenever possible, to ensure adequate refereeing and suitable distribution and to facilitate rapid processing and publication. International organizations concerned with publication problems in marine science should continue to explore ways to improve the publication of symposia and other relevant materials, including the strengthening of certain existing series and their joint use by several organizations.

Possibilities for improving the utility of SCOR Proceedings were discussed. No specific suggestions for changes in content or format were made, but it appeared that wider distribution would be desirable. At present, copies are sent to SCOR members, members of working groups, national committees (as many as 50 copies to some committees) and interested organizations. To the extent that SCOR membership is broadened (see item 4.1), a broader distribution will be achieved. It was further proposed that FAO and UNESCO consider the purchase of several hundred additional copies for allocation to their depository libraries.

1.3 BUDGET AND FINANCE

An estimate of SCOR finances through 31 March 1970 is given in Annex II. The increased activities planned for 1970, including sea trials of Working Groups 15 and 21 (see item 2.2) and the Joint Oceanographic Assembly (see item 5.2) will entail expenditures significantly in excess of income, and it is anticipated that by the end of 1970, reserve funds will be reduced to the level of a few thousand dollars. With regard to the Tokyo meeting, it was agreed to request \$2500 from ICSU as part of the required support.

The Executive Committee at its 13th Meeting recognized that in the future additional support would be required from UNESCO and from National Committees, and the President was requested to discuss the matter in correspondence with appropriate parties. A circular letter was sent on 13 January 1970 to SCOR Members and National Committees, outlining the present and proposed budget and program of SCOR and requesting favorable consideration of a proposed new level of national contributions. Replies to this circular have been favorable, several countries already agreeing to the proposed increases and, in some cases, to the next higher category of payment. It is hoped that formal action can be taken by SCOR at its 10th General Meeting in September and that the approval of ICSU can be obtained shortly thereafter. Meanwhile, the President was authorized to request additional support from ICSU for the years 1971 and 1972.

The question of increased support for SCOR was discussed at the 11th Meeting of the IOC Bureau and Consultative Council, resulting in adoption of the following recommendation:

"Recommendation 11.16 - Financial support for SCOR.

The Bureau and the Consultative Council

Having taken note that the activities of the Scientific Committee on Oceanic Research (SCOR) of ICSU, in response to the Commission's request for scientific advice, have resulted in increased costs to SCOR over the past years

whereas the level of support provided through UNESCO has remained generally constant;

Expresses the opinion that the present funding to SCOR is inadequate to meet its tasks for supporting IOC in the coming years especially in fulfilling its responsibilities with respect to the development of LEPOR; and

Calls upon the Secretary of IOC to take the necessary measures through the appropriate channels for a review of the scope and terms of the arrangements with the ICSU Scientific Committee on Oceanic Research (SCOR) leading to a substantial increase in the funds provided to it."

The Secretary of IOC reported that the UNESCO budget for 1971-72 does not provide for increased support, but that as instructed by the recommendation, he is exploring ways by which additional funds can be provided.

2.0 WORKING GROUPS

2.1 ACTIVITIES RELATED TO PREVIOUS WORKING GROUPS

WG 17 Photosynthetic Pigments: Dr. Humphrey, serving as rapporteur for this subject, had written to and visited a number of specialists. His report had drawn attention to the need for further work on methods and particularly for a comparison of fluorimetric and spectrophotometric techniques. At present he considered that progress could best be achieved through continued studies in individual laboratories rather than through international action.

The Executive Committee, in accepting Dr. Humphrey's report, noted that since pigment measurements are often made with the object of obtaining some assessment of biomass and photosynthetic potential, attention should be drawn to the great need for intensified studies of:

1. The variation in pigment composition and concentration in different species under different environmental conditions and in different states of nutrition, and
2. The variation in photosynthetic effectivity of the different chlorophylls.

WG 19 Micropaleontology of Marine Bottom Sediments: At the suggestion of this group, IUGS established a Working Group for a Biostratigraphic Zonation of the Cretaceous and the Cenozoic as a Basis for Correlation in Marine Geology, which met in Palisades, New York on 14-16 July 1969. The report of this meeting has been published in Geological Newsletter, vol. 1969, no. 3, pp. 199-207. In the future, the group will be known as the Working Group for Correlation of Cretaceous and Cenozoic Marine Deposits; a second meeting is planned for the last quarter of 1970.

WG 25 Nutrient Chemistry: The nutrient intercalibration experiment proposed by this group is being organized by the ICES Working Group on Chemical Analysis of Sea Water. In January 1970, 55 laboratories received sets of standard samples for analysis; a preliminary report is anticipated by October 1970.

In discussing the present status of nutrient analysis, the Executive Committee recognized that substantial progress had been made in improving the accuracy and comparability of nutrient measurements. Advances in chemical techniques now made it possible to estimate precisely variables hitherto unavoidably neglected. Furthermore, recent research on algal physiology had shown that earlier concepts of nutrient limitation may require considerable modification. It was agreed, therefore, that a reappraisal of nutrient limitation would be timely, to evaluate the usefulness of existing nutrient determinations and to determine the necessity for measurements of

other non-conservative properties not presently estimated. This reappraisal should first be carried out nationally, and national committees should be encouraged to convene discussions on the problem. Subsequently, international consideration may be desirable.

2.2 REPORT ON EXISTING GROUPS

It was noted that reports should be received from all present working groups for consideration by the 10th General Meeting in September, when decisions must be reached on continuation of each group.

WG 10 Oceanographic Tables and Standards (with ICES, IAPSO and UNESCO): The Panel met in Kiel, Germany (FRG) on 10-12 December 1969; the report of the meeting is given in Annex IV. Dr. K. Grasshoff was elected Chairman, to replace Mr. F. Hermann who was unable to continue in that capacity. A number of additional precision measurements were recommended, and a procedure for calculating new oxygen solubility tables was approved. The Panel proposed to meet again when the proposed measurements had been made.

WG 15 Photosynthetic Radiant Energy (with IAPSO and UNESCO): The Group met in Miami on 17-21 November 1969 to discuss organization of the sea trials to be held aboard DISCOVERER and to inspect the ship. The trials are scheduled for the period 30 April to 3 or 4 June 1970 and will be held in the Caribbean Sea and the eastern South Pacific. A scientific party of 15 will be concerned with WG 15 measurements. Expenses of the UK participant, Mr. Ian Baird, are being met from national sources. UNESCO and SCOR are funding four and five participants respectively. IAPSO was able to make only a token contribution, the expenses of their nominees being met from a grant (U.S. National Science Foundation) to Mr. Tyler. Ship operating expenses are being provided by the U.S. Environmental Science Services Administration.

WG 21 Continuous Current Velocity Measurements (with IAPSO and UNESCO): During the period 20 March - 3 April 1970, the Group conducted an intercalibration experiment aboard AKADEMIK KURCHATOV. Six types of current meters were compared for a period of 13 days, on four test moorings at 15°N on the eastern slope of the Mid-Atlantic Ridge. Facilities for the experiment were provided by the USSR Academy of Sciences. In addition to the three participants supported by SCOR, IAPSO and UNESCO, there were two participants each from the Bedford Oceanographic Institute (Canada) and the Institut für Meereskunde (Germany, GDR), supported from national sources. A preliminary report of the work is given in Annex V.

The Executive Committee expressed its gratitude to the USSR Academy of Sciences for making this important experiment possible. It was agreed that, because of his valuable contributions, Dr. Ferris Webster should be invited to become a member of the Group.

WG 23 Zooplankton Laboratory Methods (with UNESCO): Dr. Steedman submitted a brief progress report on the studies of reliable fixatives and preservatives being conducted under his supervision in a number of laboratories. The work has been hampered by a lack of funds and/or personnel in several of the laboratories, and in any case, cannot be completed at an early date because long-term storage of samples is involved. Yet, despite these difficulties, the Executive Committee was impressed with the steady progress being made on this important problem. The Chairman of WG 23, Dr. Hansen, will be asked for an evaluation of the program for consideration at the 10th General Meeting.

WG 24 Estimation of Primary Production under Special Conditions (with IBP/PM): The second meeting of the Group is scheduled for 9-12 November 1970 in Nanaimo (Canada). It is anticipated that upon completion of the report of that meeting, the Group can be disbanded.

The following publication relevant to the work of this Group has been issued by the U.S. National Committee to SCOR:

"Recommended Procedures for Measuring the Productivity of Plankton Standing Stock and Related Oceanic Properties" (available from NAS Printing and Publishing Office, 2101 Constitution Avenue, N.W., Washington, D.C., 20418, \$3.25).

WG 27 Deep-Sea Tides (with IAPSO and UNESCO): Status reports on this Group should be available for discussion at the 10th General Meeting.

WG 28 Air-Sea Interaction (with IAMAP and IAPSO): Status reports on this Group should be available for discussion at the 10th General Meeting.

WG 29 Continuous Monitoring in Biological Oceanography (with ACMRR, UNESCO and IBP/PM): The first meeting of the Group is scheduled for 25-29 May 1970 in La Jolla, U.S.A.

WG 30 Scientific Aspects of International Ocean Research (with ACMRR and WMO): Agreement of the other sponsoring bodies should be obtained so that a decision on disbanding this group can be made at the 10th General Meeting.

WG 31 East Atlantic Continental Margins (with UNESCO and IUGS): The symposium organized by this Group was held in Cambridge, 23-27 March 1970, following the 14th Executive Meeting. Recommendations of the meeting are given in Annex VI. Although it was not possible to discuss these recommendations, the Executive Committee agreed that the Group would have carried out its terms of reference by the end of the symposium, and should be disbanded at the 10th General Meeting.

WG 32 Biological Data Inventories (with ACMRR): The Group held its first meeting in Washington, 20-24 April 1970. The report of the meeting is given in Annex VII.

WG 33 Phytoplankton Methods (with IBP/PM): The first meeting of the Group is scheduled for 1-3 December 1970 in Kingston, Rhode Island (USA).

WG 34 Oceanographic Basis of Ocean Monitoring and Prediction Systems: Establishment and terms of reference of this Group were agreed at the 13th Executive Meeting, but it was decided to await the outcome of the first meeting of the IOC Group of Experts in the Field of Ocean Variability before proceeding with organization of the new SCOR working group. The IOC meeting demonstrated the desirability of forming a small group of specialists to work on specific aspects of the overall problem. Meanwhile, Professor Stommel proposed that a working group be established to consider a mid-ocean dynamics experiment (MODE) to answer the question "is the dynamics of the general circulation of the ocean similar to, or very different from, that of the atmosphere?" This proposal was circulated to a number of oceanographers who gave it their enthusiastic support.

During the 14th Executive Meeting, Professor Stommel presented a summary of recent developments in geophysical fluid dynamics which indicated that the time was ripe for such consideration. While agreeing to serve as overall chairman of the working group, he proposed that initially a small (five member) theoretical panel be established with its own chairman. Subsequently, if this panel considered an experiment desirable, an engineering panel could be established to examine its feasibility in the light of equipment requirements.

The Executive Committee accepted this approach and considered that it was compatible with the original terms of reference. The theoretical panel should have an additional specific charge, namely, "to consider the desirability and possible design of a mid-ocean dynamics experiment to determine whether the dynamics of the general circulation of the ocean is similar to, or very different from, that of the atmosphere?" The President, in consultation with Professor Stommel, was requested to prepare a list of proposed members for approval, through correspondence, by the Executive Committee. It was noted that early consideration of this question by specialists at the national level would greatly facilitate the work of the theoretical panel.

2.3 CONSIDERATION OF NEW WORKING GROUPS

Since the Tenerife symposium in 1968, a number of oceanographic expeditions have been conducted off the north west coast of Africa. The Secretary of IABO, Professor Hempel, had suggested the desirability of a working discussion of recent results on upwelling investigations in the Canary Current region. The Executive Committee noted that the first meeting of the coordination group of the ICES/IOC Cooperative Investigations of the North East Central Atlantic (CINECA) would be held in Paris, 27-30 April 1970, and that it might be inappropriate for SCOR to take action before learning the outcome of that meeting. It was also observed that since important new observations in the region had been made by scientists from the UK and Germany (FRG), it might be appropriate for the National Committees in those countries to make bilateral arrangements for the proposed scientific discussions.

3.0 RELATION WITH UNITED NATIONS ORGANIZATIONS

3.1 ADVISORY MATTERS CONCERNING UNESCO

The Executive Committee was informed that the International Directory of Marine Scientists was being printed by FAO and would be available for distribution in the near future. Information contained in the Directory has been recorded on punched paper tape, and it is anticipated that future revisions can be handled more efficiently.

At the previous Executive Meeting, it was learned that UNESCO had accepted the SCOR proposal to publish collected reprints of selected papers resulting from scientific investigations of the deep ocean floor and its potential resources. Since then, a number of useful compilations have become available, and the Executive Committee considered that the need for such information was now being adequately met. Therefore, it was recommended to UNESCO to drop the project.

UNESCO has published a revision of the General Scientific Framework, entitled "Perspectives in Oceanography". The Executive Committee noted this publication with appreciation, expressed its thanks to Dr. Tait who undertook the revision together with the staff of the UNESCO Office of Oceanography, and requested that a few copies be made available for distribution to SCOR National Committees.

The Executive Committee considered that the contract report submitted to UNESCO gave a useful summary of SCOR activities during 1969, and decided that it should be reproduced in the Proceedings (see Annex VIII).

3.2 ADVISORY MATTERS CONCERNING IOC

Bruun Memorial Lectures: In its Resolution VI-19, the IOC decided to schedule three Bruun Lectures during plenary meetings of each future session, in which the speakers would summarize important developments during the preceding two years in the fields of solid earth studies, physical and chemical oceanography and meteorology, and marine biology. Advisory bodies were requested to assist the Bureau and Secretary in selecting appropriate speakers, and UNESCO was requested to arrange for publication of these lectures on a regular basis.

The Executive Committee noted that the next IOC Session was only one year away and that it was time to take action on this Resolution. An appropriate theme for the lectures during the 1971 Session, celebrating the tenth anniversary of the Commission, would be the findings of the International Indian Ocean Expedition. Several speakers were suggested, and the President, in consultation with the Chairman of ACMRR, was requested to make specific recommendations to IOC.

Formation of Group of Experts on Long-Term Scientific Policy and Planning: During its VI Session, IOC decided (Resolution VI-2) to establish the Group of Experts to assist in implementation of the Long-Term and Expanded Program of Oceanic Exploration and Research, leaving it to the 11th Bureau Meeting to determine principles regarding composition and selection of the Group. At the Bureau Meeting, where SCOR was represented by its Secretary, Dr. Voigt, four relevant recommendations were adopted. Three of these (11.4, 11.5 and 11.6) concerned financing of the Group's meetings, selection of members after the new IOC Statutes become effective, and review of the composition and terms of reference at the VII Session. The principal recommendation follows:

"Recommendation 11.3 - Principles for the composition and selection of the Group of Experts on Long-Term Scientific Policy and Planning.

The Bureau

Having heard the Consultative Council and scientific advisory bodies, and bearing in mind Resolution VI-2 of the Sixth Session;

Decides that the Group of Experts shall be set up according to the following principles:

(a) It shall function as a preparatory group, of scientists appointed in their personal capacity, to formulate proposals for decision by the Bureau and Consultative Council (later the Executive Council) in accordance with Resolution VI-2;

(b) It shall consist of not more than 24 members selected as follows:

(i) Not more than 16 members from nominees presented by the member countries of IOC, every country having the right to present the names of one or more scientists provided each is an expert in a different field of marine science;

(ii) Not more than 10 members from nominees presented by the scientific advisory bodies of IOC;

each nomination shall be accompanied by a curriculum vitae of that scientist;

(c) The selection referred to above shall be made by the Bureau assisted by the Secretary in consultation with the chairmen of the Commission's scientific advisory bodies. When making these selections account shall be taken of the need for broad and appropriate geographical participation and scientific expertise in the Group;

(d) At the same time, by this procedure and with these criteria a reserve list of scientists shall be prepared by the Bureau. The use of this reserve list shall be a subject of discussion at the 12th meeting of the Bureau and Consultative Council;

(e) Organizations of the United Nations system participating in ICSPRO and the Commission's scientific advisory bodies shall be invited to participate in meetings in accordance with Article 7 of the IOC Statutes;

(f) The members of the Group of Experts and any necessary replacements, after having been selected as described above, shall be informed of their selection by the chairman of IOC;

(g) The chairman of the Group of Experts shall be elected by the Group itself, preferably in advance by correspondence. The chairman will meet with the Bureau and Consultative Council (Executive Council);

Considers that the composition and selection of the Group of Experts as described above, taking into account the reserve list of names, guarantees the establishment of a Group of Experts that is:

- (a) not too large;
- (b) containing relevant scientific disciplines;
- (c) showing broad and appropriate geographic participation;
- (d) maintaining relevant scientific representation in case of inability of some of its members to attend a meeting;
- (e) consisting of members that are appointed in the same capacity;

Calls upon the Secretary to carry out the establishment of the Group of Experts as outlined above."

In a letter of 27 February, the IOC Secretary, Dr. Holt, transmitted copies of these recommendations and invited the participation of SCOR in the nomination and selection of members of the Group. This matter was discussed by the Executive Committee, and the following conclusions were transmitted to the IOC Secretary on 22 March:

1. The Executive Committee agreed that SCOR, as a scientific advisory body to the IOC, should participate in the nomination and selection of members of the Group.
2. In agreeing to participate in this activity, the Executive Committee assumed that reports of the Group would be made widely available to interested scientists, including SCOR Members and National Committees.
3. The Executive Committee noted that distribution of expenses of the Group among interested organizations, as envisaged in Recommendation 11.5, would help ensure that members could serve independently and in their private capacity. However, SCOR is a non-governmental organization and is funded in a different manner and at a different level from the other organizations directly concerned. Thus the extent to which SCOR could contribute financially would require further consideration.
4. As indicated in Recommendation 11.3, the Group should be broadly representative of the various scientific subject areas emphasized in the Expanded Program. A listing of the types of specialists required to cover the relevant subject areas was required for considering SCOR nominations and might be useful in the eventual selection of members of the Group. Accordingly, the Executive Committee prepared such a listing (see later). Despite the imperfection of this listing, the Executive Committee believed that a Group consisting of experienced marine scientists expert in these subject areas would be well qualified to deal with the broad terms of reference given in IOC Resolution VI-2.
5. Recommendation 11.3 appears to place no restriction on the number of nominees presented by scientific advisory bodies. It is likely that some scientists will be nominated both by their countries and by one or more of the advisory bodies. In view of the selection procedure established in the Recommendation, the Executive Committee decided to consider nominations in most, if not all, of the categories included in the attached listing. Identification of appropriate specialists will require further consultation among members of the Executive Committee, and it is not planned to submit nominations until some time in May.

The list of proposed specialties referred to above follows:

Physical Oceanography, Meteorology and Forecasting

Large-scale ocean-atmosphere interaction
 Small-scale ocean-atmosphere interaction
 Numerical modelling

Monitoring of oceanic conditions
General circulation of the ocean
Coastal and oceanic upwelling

Marine Chemistry, Pollution and Ocean Engineering

Tracer geochemistry
Organic chemistry
Chemical oceanography
Chemical aspects of marine pollution
Biological aspects of marine pollution
Ocean Engineering

Solid Earth Sciences and Resources

Geophysics
Tectonophysics
Igneous petrology
Sedimentology
Stratigraphy
Economic geology

Biological Oceanography and Fisheries

Basic biological processes in primary oceanic productivity
Trophodynamics of pelagic communities
Marine fishery resources
Benthic resources and productivity
Systematics and distributions of marine organisms
Populations and population dynamics

3.3 RELATION WITH FAO/ACMRR

In continuation of the close working relationship with ACMRR, the present meeting was attended by the ACMRR President, Dr. Lucas, and Secretary, Dr. Ruivo. An invitation was extended to officers of ACMRR present at the Joint Oceanographic Assembly in Tokyo to participate in the 10th General Meeting of SCOR being held on that occasion. The next ACMRR meeting will take place in October 1970, and it will be desirable for a SCOR representative to attend.

FAO has agreed to support the Tokyo Symposium on Environmental Data and Forecasting for Fisheries (see item 5.2). SCOR will join ACMRR and other organizations in sponsoring a "Seminar on Methods of Detection, Measurement and Monitoring of Marine Pollutants" to be held in Rome, 4-8 December 1970.

The ACMRR Secretary reported on progress of the reviews on transplantation of marine fauna being prepared by specialists under contract to FAO. He also reported that an ACMRR working party on the use of submersibles and underwater habitats in fisheries and related marine biological research had recommended that SCOR be invited to nominate a representative to join the group.

3.4 RELATION WITH WMO/ACOMR

WMO has established an Advisory Committee on Oceanic Meteorological Research (ACOMR) which was accepted by the IOC 11th Bureau Meeting as a scientific advisory body to IOC on meteorological aspects of oceanic programs. The SCOR Executive Committee expressed the

wish that a close working relationship could be established with this new advisory body.

4.0 RELATION WITH ICSU AND CONSTITUENT BODIES

4.1 IMPROVED ICSU ARRANGEMENTS FOR MARINE SCIENCE

In preparation for discussion of this item, a paper had been circulated describing changes in SCOR and its Constitution to reflect the proposed expansion of responsibilities. Suggestions arising during the meeting have been incorporated in the following:

Possible Attributes of an Expanded SCOR

Functions of SCOR: Functions described in the present Constitution could be expanded to include the following:

1. To review and comment on the scientific aspects of intergovernmental programs in marine science.
2. To organize scientific meetings on interdisciplinary and other oceanographic topics of broad interest.
3. To develop support among marine scientists for international oceanographic activities.
4. To represent the views of marine scientists in appropriate international discussions.
5. To support the affiliated organizations and to interrelate their activities with those of SCOR.

Membership: The base of support for SCOR should be strengthened by creating several categories of membership: (1) Members are either nominated by National Committees (each being able to nominate up to three members) or are ex officio members from affiliated organizations (i.e., Presidents and Secretaries); (2) Corresponding Members are members of active SCOR Working Groups, or are nominees of non-oceanographic organizations with a significant interest in ocean problems (such as SCAR, SCIBP, IGU, etc.); (3) Associates are other marine scientists (from any country) who wish to support the work of SCOR.

Organizational Relationships: Affiliated Organizations are those with formal links, such as IAPSO, IABO and CMG, whose Presidents and Secretaries are ex officio Members of SCOR (and whose Presidents are ex officio members of the SCOR Executive Committee). While affiliating with SCOR, such organizations maintain their customary links with parent organizations, such as ICSU Unions. It is not necessary, however, that Affiliated Organizations come from the ICSU system. Sponsoring Organizations are those which provide financial support or other services and for which SCOR performs specified functions (at present, UNESCO/IOC).

Subsidiary Bodies: (1) Executive Committee, consisting of elected members, and ex officio members from Affiliated Organizations; (2) Working Groups, which can be jointly sponsored with non-SCOR organizations; (3) Special bodies for planning or coordinating functions.

Sources of Funds: The expenses of SCOR activities would be met from a variety of sources including the following: (1) Contributions from National Committees, (2) Contracts

with Sponsoring Organizations, (3) Grants from ICSU, (4) Dues from Associates.

Role of Ex Officio Members of Executive: (1) As other members of the Executive, to attend Executive Meetings, engage in correspondence, and otherwise assist in development and execution of SCOR programs; (2) To monitor activities of SCOR Working Groups within their competence and to summarize their status and recommendations for consideration by SCOR; (3) To develop means of mutual support between SCOR and the Affiliated Organizations.

Role of Affiliated Organizations with respect to SCOR: (1) To collaborate with SCOR in organizing scientific meetings and other appropriate activities; (2) To assist in evaluation of problems within their competence arising in intergovernmental programs; (3) To assist in identifying experts to serve on SCOR working groups and special bodies.

Meetings: General Meetings at two-year intervals, with intervening Executive Meetings at eight-month intervals. Every six or eight years, a Joint Oceanographic Assembly in cooperation with Affiliated Organizations.

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In discussing the future of SCOR, the Executive Committee noted the difficulties likely to ensue in coping with the anticipated increase in workload. The work of SCOR has been conducted entirely on a voluntary basis, and it may not be possible to increase the level of activities significantly without the assistance of employed staff. The possibilities of using an existing secretariat, on a cooperative basis, were discussed, but no conclusions were reached. It was agreed, however, that in further consideration of a broadened SCOR, the problem should be kept in mind.

Discussions in Tokyo will be facilitated if specific proposals are presented. Accordingly, the President and Secretary, in consultation with Mr. Hemmen of the Royal Society and with the ICSU Secretariat, were requested to prepare a draft Constitution reflecting the concepts listed above. This should be circulated as soon as possible for consideration by National Committees and the organizations concerned, prior to the Tokyo meeting.

4.2 OTHER MATTERS

During the last ICSU Executive Meeting (October 1969), an ad hoc committee presented draft proposed rules for Scientific and Special Committees. It is not clear from the report of that meeting whether these rules were approved, or whether it is intended to circulate them to the Committees for comment. The proposed rules are not completely consistent with the present SCOR Constitution and are even less compatible with some of the concepts proposed for the broadened SCOR. Of course, it is possible that a transformed SCOR would no longer be a Scientific Committee according to the ICSU definition, but would become a new and different type of organization. The President was requested to circulate the proposed rules to members of the Executive Committee and to forward their comments to ICSU and to other interested bodies.

Dr. Rossiter, Director of the Permanent Service for Mean Sea Level, discussed the present status of PSMSL and the increasing difficulties in doing its work because of the inadequacy of funds. The Executive Committee acknowledged the great scientific and practical importance of the work of PSMSL and considered that the present low level of funding was quite incompatible with that importance. It was agreed to communicate these views to the Secretary of FAGS. The importance was noted of mean sea level data in monitoring the ocean, and thus to the IGOSS program, and it was agreed to explore the possibilities of IGOSS support with the IOC Secretariat. It was also noted that the IOC Bureau at its 11th Meeting considered (recommendation 11.17) it appropriate to use the IOC Trust Fund to help finance the provision of special scientific services.

5.0 FUTURE MEETINGS

5.1 SYMPOSIA

The First Announcement has been issued of the Symposium on the Biology of the Indian Ocean with particular reference to the International Indian Ocean Expedition, to be held in Kiel, Federal Republic of Germany, 31 March-6 April 1971. The Symposium is being organized by SCOR and IBP/PM, with the assistance of FAO, UNESCO and IABO. Program arrangements are being made by Dr. Humphrey on behalf of SCOR and Professor Krey on behalf of IBP/PM.

The Executive Committee commended Dr. Humphrey and Professor Krey on the valuable work they had done in putting together this important symposium and agreed to pursue negotiations with FAO and UNESCO on the necessary financial support. The desirability and feasibility of publishing the invited papers should also be explored with the conveners and with UNESCO, FAO, IBP and IABO.

5.2 JOINT OCEANOGRAPHIC ASSEMBLY

Since the last Executive Meeting, the Second Announcement has been printed and distributed by SCOR. A Program, listing speakers and the titles of their lectures, is to be issued by the Japanese Organizing Committee in June. FAO, through its Fishery Resources Division, has agreed to assist in the compiling and printing of abstracts of all invited papers in time for distribution at the opening of the Assembly.

The conveners of all symposia have been selected, and the invitation by them of speakers is well in hand. In order to facilitate the compilation of abstracts and programs, and the estimation of required travel expenses, it is essential to obtain promptly from members of the International Steering Committee a complete list of their speakers and topics.

The principal problem facing the organizers of the Tokyo meeting is the shortage of "international" funds. National Committees have been asked to help by supporting from national sources as many participants as possible. The IOC has adopted a resolution endorsing the Assembly and urging member states and international organizations to provide the necessary financial support. Although UNESCO, FAO and WMO have not made an adequate budgetary provision for the Assembly, it is likely that support for several symposia will be forthcoming. The Executive Committee agreed to request ICSU to provide \$2500 to assist the associations in funding their invited speakers.

It was noted that arrangements should be made for the General Session "International Union of Marine Sciences?" scheduled for the afternoon of 22 September. It seemed appropriate for SCOR to take the responsibility for organizing this session, in consultation with other organizations concerned.

5.3 BUSINESS MEETINGS

The 15th Executive Meeting, following the 10th General Session, should be in May 1971. The President was requested to explore possible sites for this meeting and to report to the 10th General Meeting. The 11th General Meeting will be in the United Kingdom, possibly in Oban, in September 1972.

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A number of resolutions dealing with various aspects of ocean affairs were adopted by the United Nations General Assembly at its 24th Session. These are reproduced in Annex IX. A list of future meetings of SCOR and associated organizations is given in Annex X.

14th SCOR EXECUTIVE MEETING
London, 17-21 March 1970

List of Participants
MEMBERS OF THE EXECUTIVE COMMITTEE

Professor Warren S. Wooster	(U.S.A.)	President
Captain Luis R.A. Capurro	(Argentina)	Retiring President
Professor Trygve Braarud	(Norway)	Vice President
Dr. Klaus Voigt	(Germany, GDR)	Secretary
Mr. Ronald I. Currie	(IUBS/IABO)	Ex Officio
Dr. Thomas F. Gaskell	(IUGS/CMG)	Ex Officio

OTHER PARTICIPANTS

Professor C. Burdon-Jones (Australian National Committee)	Professor J.E.G. Rayment (U.K. National Committee)
Sir Edward Bullard (IUPAP)	Dr. J.R. Rossiter (U.K. National Committee)
Dr. George R. Deacon (SCOR Member from U.K.)	Dr. Mario Ruivo (FAO/ACMRR)
Dr. H.A. Cole (U.K. National Committee)	Professor Eugen Seibold (FRG National Committee)
Mr. C.G. Hide (South African National Committee)	Professor E.S.W. Simpson (CMG Secretary, South African National Committee)
Dr. Sidney J. Holt (UNESCO/IOC)	Professor Henry Stommel (U.S. National Committee)
Mr. George E. Hemmen (SCAR)	Dr. Hans Tambs-Lyche (ICES)
Mr. Arthur J. Lee (U.K. National Committee)	Mr. N.L. Veranneman (WMO)
Dr. Cyril E. Lucas (ACMRR Chairman)	

ANNEX II

ESTIMATE OF SCOR FINANCES
(1 January thru 31 March 1970)

BALANCE as of 1 January 1970

In Rome	\$ 5,633.63 *
In La Jolla	12,840.08
	<u>\$ 18,473.71</u>
* 2,133.63 in Indian Rupees	

INCOME

National Contributions	5,894.15	
Interest on Savings	<u>125.16</u>	6,019.31
		<u>\$ 24,493.02</u>

EXPENSES

Office		1,241.84
Publications		44.80
Working Groups		
WG 15	2,560.20	
WG 31	1,566.00	
WG 32	<u>602.00</u>	4,728.20
Executive Expense		1,525.34
Representatives, other meetings		<u>847.77</u>
		<u>\$ 8,387.95</u>

BALANCE as of 31 March 1970

In Rome	4,828.79 *
In La Jolla	<u>11,276.28</u>
* 2,633.63 in Indian Rupees	<u><u>\$ 16,105.07</u></u>

NATIONAL COMMITTEES
of the
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

Argentina National Committee on Oceanography
Attn: Dr. Rogelio Lopez
Consejo Nacional de Investigaciones Cientificas
y Tecnicas
Rivadavia 1917
Buenos Aires, ARGENTINA

Australian National Committee on Oceanic
Research
Attn: Mr. J. Deeble, Secretary
Gordon Street
Canberra Capitol Territory
AUSTRALIA, 2601

Canadian National Committee on Oceanography
Sir Charles Tupper Bldg.
Confederation Heights
Ottawa 1, Ontario
CANADA

Chilean Committee for Oceanic Research
Attn: Captain R. Herrera
Instituto Hidrafico de la Armada
Casilla 324
Valparaiso, CHILE

Chinese Committee for Oceanic Research
Attn: Dr. V.C. Juan, President
c/o College of Science
National Taiwan University
Taipai, Taiwan, CHINA

Danish National Committee for Oceanography
Attn: Secretary
Universitetets Institut for Oceanografi
Solvgade 83
1307 Copenhagen K, DENMARK

SCOR National Committee for Finland
Attn: Dr. J. Lassig, Secretary
Institute of Marine Research
Box 14166
Helsinki 14, FINLAND

French National Committee for Oceanic
Research
Attn: Professor H. Lacombe, Secretary
Laboratory of Physical Oceanography
43 Rue Cuvier
Paris Ve, FRANCE

German SCOR Committee
Attn: Professor Dr. G. Hempel, Secretary
Institut für Meereskunde
Universität Kiel
Niemannsweg 11
23 Kiel, GERMANY, FRG

German Committee for Oceanic Research
Attn: Professor Dr. E.H.R. Rompe,
Administrative General
Deutsche Akademie der Wissenschaften zu
Berlin
Berlin, GERMANY, GDR

Indian National Committee on Oceanic
Research
Attn: Dr. N.K. Panikkar, Secretary
National Institute of Sciences of India
Miramar, Panaji (GOA) INDIA

Indonesian National Committee on Oceanic
Research
Attn: Commodore Wardiman, Chairman
Dj1. Gunung Sahari 87
Djakarta, INDONESIA

Israel National SCOR Committee
Attn: Dr. Ch. Yahil
The Israel Academy of Sciences & Humanities
P.O. Box 4040
Jerusalem, ISRAEL

Comite Italiana di Oceanografia e Limnologia
Attn: The President, CNR
Consiglio Nazionale delle Ricerche
Piazzale delle Scienze 7
Roma, ITALY

National Committee on Oceanic Research
Attn: Dr. Yoshio Horibe
Ocean Research Institute
University of Tokyo
Nakano, Tokyo, JAPAN

Monaco National Committee on Oceanic
Research
Attn: President Arthur Crovetto
Centre Scientifique de Monaco
16 Boulevard de Suisse,
MONACO

Netherlands Committee for Oceanic Research
Royal Netherlands Academy of Sciences &
Letters
Kloveniersburgwal 29
Amsterdam-C, NETHERLANDS

New Zealand National Committee for Oceanic
Research
Attn: Mr. G.W. Markham, Executive Officer
The Royal Society of New Zealand
Victoria University Bldg.
P.O. Box 196
Wellington, NEW ZEALAND

Norwegian SCOR Committee
Attn: Professor T. Braarud, Chairman
Institute of Marine Biology B
P.O. Box Blindern 1069
Oslo 3, NORWAY

National Committee on Marine Sciences
Attn: Dr. L. Brillo, Executive Secretary
National Science Development Board
95 E. Rodriguez Sr. Blvd.
Quezon City, THE PHILIPPINES

Polish National Committee on Oceanic
Research
Attn: Professor Dr. F. Pautsch
Komitet Baden Morza PAN
Sopot, Powstancow 2/6, POLAND

Portuguese National Committee on Oceanic
Research
Attn: Cdr. Jose de Ataida
Instituto Hidrografico
Rua do Arsenal, Porta H-1º
Lisbon-2, PORTUGAL

South African National Committee for Oceano-
graphic Research
Attn: Mr. H.J. van der Merwe, Secretary
Science Cooperation Division, CSIR
P.O. Box 395
Pretoria, SOUTH AFRICA

Swedish National Committee for Oceanic
Research
Attn: Secretary
Oceanographic Institute
P.O. Box 1038
Göteborg 4, SWEDEN

National Marine Science Committee of
Thailand
Attn: Dr. Pradisth Cheosakul, Deputy Sec-
retary General
196 Paholyodhin Road
Bangkhen, Bangkok, THAILAND

National Committee for Oceanography
Attn: Dr. H.A.F. Gohar, Chairman
Ministry of Scientific Research
101, Kasr El-Einy Street
Cairo, U.A.R.

British National Committee for Oceanography
Attn: Mr. G. Hemmen, Executive Secretary
The Royal Society
6 Carlton House Terrace
London, S.W. 1, UNITED KINGDOM

National Committee on Oceanography
Attn: Mr. R.C. Vetter, Secretary
National Academy of Sciences
2101 Constitution Avenue
Washington, D.C., 20418, U.S.A.

National Committee Soviet Oceanography
Attn: Academician L.A. Zenkevich
34 Vavilov Street
Moscow, V-312, U.S.S.R.

REPORT OF SCOR WORKING GROUP 10
UNESCO/SCOR/IAPSO/ICES JOINT PANEL
ON OCEANOGRAPHIC TABLES AND STANDARDS
Report of Meeting in Kiel, 10-12 December 1969

The meeting was held in the Institute for Applied Physics, University of Kiel, with the following members in attendance:

F. Hermann (Chairman), O. Saelen, F. Culkin, N.P. Fofonoff, W. Kroebel,
K. Grasshoff, F. Fisher, M. Menache.

Dr. G.N. Ivanoff-Frantzkevich was unable to attend. The following observers were present:

G. Giermann (UNESCO), K. Kremling (Inst. für Meereskunde), W.S. Wooster (SCOR).

Refractive Index

Dr. Culkin referred to the work of Dr. J.S.M. Rusby published in Deep-Sea Research (vol. 14, pp. 427-439, 1967); the results have been incorporated in the International Oceanographic Tables. Although it would be useful to have these measurements confirmed, the Panel was unable to propose someone to repeat the measurements with the same high precision. With publication of the tables, the Panel considered its task in this area to be fulfilled.

Dissolved Oxygen

As proposed by the Panel during its meeting in Bern, the ICES Subcommittee on Chemical Analysis of Sea Water was asked to recommend further steps with respect to oxygen solubility tables. The ICES group in 1967 recommended the smoothing equation of E.J. Green as the basis for such tables. In the meantime, new independent measurements of oxygen solubility in sea water have been made by J. Carpenter and by J.P. Riley. These new measurements agree well with each other but differ somewhat from those of Green.

A meeting of specialists concerned with the question was convened in Fort Lauderdale in February 1969, by SCOR and the U.S. National Academy of Science Committee on Oceanography. The following participated:

D.E. Carritt (Chairman), B. Benson, E.J. Green, J.L. Carpenter, J. Gieskes,
J.P. Riley, K. Grasshoff.

At this meeting, it was concluded that the raw data - after some correction to Green's measurements - agreed well and that no significant differences could be found despite the fact that very different techniques had been used. It was decided that each experimenter should apply his own technique of smoothing and interpolation to the set of all raw data. Experimental values departing from the curve by more than ± 0.03 ml/l should be rejected, and the smoothing should be repeated using the remaining data. These calculations should be submitted to Professor Carritt not later than the fall of 1969. It was not felt that new measurements would improve significantly the reliability of the existing data.

Unfortunately, the recalculated saturation values were not submitted in time for a comparison of the different treatments to be made at the Kiel meeting.

Meanwhile, R. Weiss (Scripps Institution of Oceanography) developed a simple equation for smoothing the experimental data of Carpenter and Riley. The equation has a sound thermo-

dynamical basis, being derived from the Vant' Hoff equation for the dependence of the Bunsen solubility coefficient on temperature and from the Setchenof equation for the salinity dependence. The equation has the form

$$\ln c = A_1 + A_2 \frac{100}{T} + A_3 \ln\left(\frac{T}{100}\right) + A_4 \frac{T}{100} + S^{\circ}/\text{‰} (B_1 + B_2 \frac{T}{100} + B_3 \frac{T^2}{10^4})$$

and gives a mean standard deviation from the experimental data, depending on the source of data, of ± 0.018 ml/l or ± 0.016 ml/l.

The Panel considered this equation the best now available for calculation of the new saturation tables. Therefore, it was decided to send a copy of Weiss' preliminary paper to participants of the Fort Lauderdale meeting asking for comments by January 1970. It should then be possible to calculate the new tables by April and forward them to UNESCO in May.

Specific Gravity

Dr. Culkin gave a final report on the measurements of the specific gravity of sea water as a function of temperature and salinity. These measurements are the basis of new tables to be published by UNESCO. In a discussion of format, the Panel considered most convenient that used by the U.S. Navy Oceanographic Office for the determination of sigma-t from temperature and salinity.

Confirmation of the basic N.I.O. measurements by an independent laboratory was considered desirable, but the Panel could not suggest one being able to do this with the same accuracy. In this connection, Dr. Kremling mentioned a new densitometer¹ available in Kiel by which specific gravity can be determined with a precision of ± 3 in the 3d decimal of sigma-t. Measurement is made of the Eigenfrequency of a glass capillary filled with the sample; each determination takes about ten minutes. Preliminary comparisons with NIO measurements have been made with this instrument, with good results.

Before the final edition of the UNESCO tables, the Panel recommended that the silicate content of the reference water be checked. Attention should be paid to the results of Russian studies of the specific gravity - temperature - salinity relationship. Mr. Crease (British Oceanographic Data Center) should be approached by Mr. Culkin for calculation and interpolation of the new tables, in cooperation with Drs. Fofonoff and Fisher. As suggested by Mr. Menache, the new temperature scale should be used.

The Panel discussed the need to compare actual measurements of specific gravity of water samples randomly selected from all parts of the world ocean with sigma-t values for the same samples calculated from temperature and salinity determined by conductivity measurement. Such measurements now seemed feasible with the new precision instrument available in Kiel. The Panel recommended that all necessary support be given Dr. Kremling for making such measurements. Dr. Kremling will approach several institutions for obtaining appropriate samples. He was also asked to perform some independent cross checks on N.I.O. samples.

Isotopic Composition

Mr. Menache reported on measurements of the isotopic composition of reference water distilled according to N.I.O. procedure from deep (about 2000 m) water of the western Mediterranean. Using samples supplied by N.I.O. and by the Institut für Meereskunde, Kiel, there appeared to be no significant difference between isotopic composition of the original water and that of the distillates. The distillation procedure can then be recommended as a standard pro-

1) Model DMA02, Anton Paar KG, A-8054 Graz, Postfach 17, Austria

cedure for obtaining reference water for the determination of specific gravity. In this connection, adoption of the new temperature scale was again noted. The Panel requested its new chairman to submit a short note on this matter to some of the major journals in marine science. The Panel recommended strongly that all calibration certificates and similar documents should state the use of the new scale.

Thermal Expansion

A report was read from Dr. Ivanoff-Frantzkevich concerning Russian measurements of thermal expansion, to be completed by mid-1970. Dr. Fofonoff reported on the present work of Bradshaw and Schleicher (W.H.O.I.) for salinities of 30.5, 35.0 and 39.5% at pressures from 1 to 1000 bars.

Pressure Dependence of Conductivity

The Panel discussed the need for new independent measurements of this function. The number of in situ pressure-conductivity-temperature instruments is rapidly increasing. Apart from experiments underway at the Institute of Applied Physics, Kiel, Panel members were not aware of a laboratory engaged in conductivity-pressure measurements. Members agreed to investigate the status of plans for such measurements.

There is also an urgent demand for extension of the temperature correction values of relative conductivity below the range published in the International Oceanographic Tables. The low range, below 12°C, is of special interest since most in situ conductivity measurements are made at low temperatures. At present, it is impossible to convert conductivity measured at low temperatures into conductivity at 15°C, by use of the tables.

The problem with respect to in situ instruments can be seen in the following system of ratios, developed by Dr. Fofonoff. These instruments measure the ratio

$$\frac{\lambda(T, S, P)}{\lambda(15, 35, 0)}$$

where λ , T, S, P indicate electrical conductivity, temperature, salinity and pressure respectively. To convert these measurements to salinities, it is necessary to know the function

$$f(T, S, P) = \frac{\lambda(T, S, P)}{\lambda(15, 35, 0)}.$$

This ratio can be separated into several ratios, as follows:

$$\frac{\lambda(T, S, P)}{\lambda(15, 35, 0)} = \frac{\lambda(T, S, P)}{\lambda(T, S, 0)} \cdot \frac{\lambda(T, S, 0)}{\lambda(15, S, 0)} \cdot \frac{\lambda(15, S, 0)}{\lambda(15, 35, 0)}$$

The last ratio is R_{15} which is tabulated in the International Oceanographic Tables, but measurements of the second ratio have not been made. To calculate salinities from the measured ratio and measured temperature and pressure, it is necessary to measure the ratio

$$\frac{\lambda(T, S, 0)}{\lambda(T, 35, 0)}$$

at temperatures below 12°C, or to measure the ratio

$$\frac{\lambda(T, S, 0)}{\lambda(15, S, 0)}.$$

Sound Velocity

Professor Kroebel reported on measurements of sound velocity as a function of salinity, temperature, and pressure. A new instrument, capable of such measurements at a new level of precision, has been developed at his Institute. When the fundamental relationships are known, sound velocity could be used for the determination of, for example, pressure or density. After visiting the Institute and seeing the outstanding instrumentation and experimental arrangements for measuring these fundamental relationships, the Panel agreed to give Professor Kroebel all possible support.

Equation of State

Dr. Fisher reported on progress in establishing a satisfactory equation of state for sea water. A summary of this report is attached.

Influence of Ionic Composition

Dr. Kremling reported his investigations on the influences on conductivity of changes of ionic composition of sea water at lower salinities. Note was made of previous papers of Park and Grasshoff, especially on the effect of the state of the carbonate system on conductivity. The Panel agreed that such changes should not be neglected. Verification of the combined effects of sampling, storage and changes in ionic composition is needed. Laboratory experiments show clearly that the third decimal place of salinity is influenced, making doubtful the accuracy to this place of salinity from conductivity measurements. The difference between accuracy and precision should be clearly understood by all users of conductivity instruments. Accuracy can be checked by measuring density with the new densitometer referred to above. Only with such measurements can the third decimal place be assured.

To check how changes in the carbon dioxide system affect the routine determination of salinity, the Panel proposed that interested institutions make replicate determinations on a number of samples, of conductivity ratio, density, chlorinity and pH at a number of time intervals after collection of the sample.

New Tables

New sigma-t tables should be calculated as soon as independent checks have been made by Dr. Kremling. The tables and nomographs should be ready for submission to UNESCO by the end of 1970. Oxygen saturation tables should be ready by mid-1970. It was agreed that these tables should have the arguments cm^3/dm^3 , salinity and temperature. Intervals should be full units of salinity and 0.2° in temperature. To facilitate computation of tables in other units, such as ml (S,T,P) per kilogram of water or micromoles or microgram atoms per liter, appropriate coefficients and equations should be published in the preface to the tables.

The new determinations of specific gravity do not deviate significantly from values published in the Knudsen Hydrographic Tables to the second decimal place in chlorinity. Therefore, the Panel felt that the Knudsen values are sufficient for the computation of a salinity-chlorosity table at 20°C . Professor Grasshoff was asked to compile such a table with suitable arguments and intervals. This table should be included as an annex to the International Oceanographic Tables, as recommended at the Bern meeting of the Panel.

Business Matters

At the conclusion of the meeting, Professor Grasshoff was selected as the next Chairman.

It was agreed that the Panel should meet again when recommended investigations and measurements had been completed, and when further sections of the International Oceanographic Tables could be considered.

The two attached recommendations were formally adopted, and the Chairman was requested to bring them to the attention of the sponsoring bodies.

Gratitude was expressed to the various Panel members who had reported on work accomplished since the last meeting, and to Professor Kroebel for the hospitality of his Institute. The meeting closed at noon on 12 December.

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Recommendation No. 1

The Joint Panel on Oceanographic Tables and Standards determined that knowledge of the absolute density of sea water as a function of temperature and salinity is necessary to an accuracy of one part per million. Such precision cannot be obtained without measurements of density of pure water to at least the same accuracy in order to use pure water as a reference for the sea water measurements. With the adoption of the new International Practical Temperature Scale in 1968 (Metrologia, 1969, V (2), pp. 35-44) in which the triple point of pure water is taken to be of water having the isotopic composition of ocean water, it is recommended that measurements of the following properties be made at a pressure of one normal atmosphere of degassed water of known isotopic composition, preferably as close as possible to that specified above.

- 1) Absolute density at 4°C and preferably at at least two other temperatures 0° and 20°C.
- 2) Thermal expansion to an accuracy sufficient to calculate density to the required accuracy from 0° to 40°.

The Panel recommends that the measurements be made at least at two different laboratories, such as Bureau International des Poids et Mesures, National Bureau of Standards, National Physical Laboratory.

Considering that, at temperatures superior to 16°C, the density of pure water is now known only with an insufficient precision, it is recommended that, at the time of future determinations of density of sea water, the calibration with pure water is made at 4 or 0°C solely, the thermic dilatation of the sinker (or pycnometer), if it is not known, being able to be determined on a sample of same material, interferometrically.

The Panel hopes that, if necessary, funds can be obtained to insure that this work can be accomplished.

Recommendation No. 2

Taking into account the increasing use of instruments for in situ measurements of conductivity, the Joint Panel strongly recommends that:

- a) High precision measurements of conductivity ratio of sea water are carried out in the temperature range 0°C to 14°C.
- b) That high precision measurements are made of conductivity as function of temperature and pressure.
- c) That high precision measurements are made of sound velocity as function of temperature, salinity, and pressure.

Analytic Equation of State for Water and Sea Water

F.H. Fisher,
Robert Bruce Williams and O.E. Dial, Jr.

University of California, San Diego
Marine Physical Laboratory
of the
Scripps Institution of Oceanography

The following is a brief summary of the results of work reported at the meeting of the Joint Panel on Tables and Oceanographic Standards in Kiel, Germany, December, 1970. This work will be presented for publication in more detail at a later date, probably in the Journal of Geophysical Research.

The equation used is the Tumlirz equation used by Eckart ^{1/} in his paper on this subject

$$V = V_{\infty} + \frac{\lambda}{P_0 + P} \quad (1)$$

where V is the specific volume (cc/gm), P the pressure (bars) and V_{∞} , λ , and P_0 are temperature dependent parameters. This equation fits the pure water P/V data of Kell and Whalley ^{2/} (K&W) to a precision with the standard deviation of approximately 10 PPM over the temperature range of 0 to 100°. A total of 20 terms appear in the three parameters V_{∞} , λ and P (Table I).

In attempting to fit Eq. (1) to the sea water data of Wilson and Bradley ^{3/}, (W&B), the most extensive set of experimental data from a single laboratory, we found that P_0 , λ and V_{∞} displayed an erratic

dependence on salinity. When λ was constrained to be the value derived from the pure water data of Kell and Whalley, it was found that P_0 and V_{∞} displayed a linear dependence on salinity. Finally, the equation used to fit the sea-water data is that shown in Equation (2)

$$V = V_{\infty} - K_1 S + \frac{\lambda}{P_0 + K_2 S + P} \quad (2)$$

where λ , V_{∞} and P_0 are those values used to fit the pure water data. K_1 displays a quadratic temperature dependence and K_2 a linear one (Table I).

Use of Bradshaw and Schleicher's ^{4/} (B&S) data on thermal expansion has been incorporated in our results in the coefficient K_1 . It appears from the B&S data that the W&B data is less reliable at low temperatures.

It should be noted that the pure water equation has a density maximum at 4.00°C. Use has been made of the atmospheric pressure data discussed by Kell ^{5/} in addition to the PV data of K&W.

The density maximum for sea water shows a greater salinity dependence; that is, the cross-over of the freezing point and the density maximum occurs at a lower salinity than stated in the text books, in this case at ~22‰ instead of ~25‰.

This equation, FWD for Fisher, Williams and Dial, then requires 20 terms for the 0-150° pure water data and only five additional terms for sea water. A truncated equation for pure water will be examined to see if the number of parameters for pure water can be reduced in order

to represent only the data between 0° and 40°.

Table II shows the fit of the FWD equation to the W&B data.

Table III summarizes results of various investigators for the thermal expansion coefficient of sea water shown in the W&B technical report along with our results.

Table IV in an analogous manner summarizes the specific volume results along with ours and those calculated by us from Li's results.

Similarly, Table V summarizes the compressibility results.

In Table VI we compare our results for thermal expansion ($\partial V/\partial T$) against those of B&S as a function of temperature, salinity and pressure. At 0° we find the greatest disagreement with their results.

In Table VII we do see, however, that changes in specific volumes from -2° to +2° calculated by the FWD equation compare very favorably with the results of B&S. In this case we are comparing our values from our equation against their raw data.

Values of the adiabatic gradient calculated from the FWD equation for S=35‰ were slightly lower than those reported by Fofonoff ^{6/}, for example, 4% at 2° and 400 bars and 7% at 2° and 1,000 bars.

REFERENCES

1. C. Eckart, Am. Jour. Sci., 256, 225 (1958).
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TABLE I

TUMLIRZ EQUATION FOR PURE WATER AND SEA WATER

$$V = V_{\infty} - K_1 S + \frac{\lambda}{P_0 + K_2 S + P}$$

$$\begin{aligned}\lambda &= 1788.316 + 21.55053T - 0.4695911T^2 + 3.096363 \times 10^{-3} T^3 - .7341182 \times 10^{-5} T^4 \\ P_0 &= 5918.499 + 58.05267T - 1.1253317T^2 + 6.6123869 \times 10^{-3} T^3 - 1.4661625 \times 10^{-5} T^4 \\ V_{\infty} &= .6980547 - .7435626 \times 10^{-3} T + .3704258 \times 10^{-4} T^2 - .6315724 \times 10^{-6} T \\ &\quad + .9829576 \times 10^{-8} T^4 - .1197269 \times 10^{-9} T^5 + .1005461 \times 10^{-11} T^6 \\ &\quad - .5437898 \times 10^{-14} T^7 + .169946 \times 10^{-16} T^8 - .2295063 \times 10^{-19} T^9 \\ K_1 &= 2.679 \times 10^{-4} + 2.02 \times 10^{-6} T - 6.0 \times 10^{-9} T^2 \\ K_2 &= 10.874 - 4.1384 \times 10^{-2} T\end{aligned}$$

 λ bars cc/gm P, P_0 bars K_2 bar/o/oo V_{∞} cc/gm K_1 cc/gm/o/oo

TABLE II

Standard deviations in parts per million of the fit of the FWD equation to raw specific volume data of Wilson and Bradley vs. temperature and salinity. (Temperature cited is nominal since data were taken at varying temperatures near cited one.) The average of the standard deviations is 107 ppm for all the data.

T S o/oo	10.221	20.720	30.881	35.568	40.370
~ 0°	208	175	230	264	156
~ 5°	173	129	212	187	236
~ 10°	128	51	167	172	45
~ 15°	102	38	94	134	55
~ 20°	42	76	44	140	37
~ 25°	17	60	85	95	62
~ 30°	17	106	93	47	104
~ 35°	22	117	55	43	98
~ 40°	19	154	34	100	161

TABLE III

THERMAL EXPANSION OF SEA WATER (S = 35°/00)
COMPARISON TABLES

T°C	P Bars	Hydrographic Tables x 10 ⁻⁵	Eckart x 10 ⁻⁵	Crease x 10 ⁻⁵	NOL x 10 ⁻⁵	FWD x 10 ⁻⁵
0°	1	5.2	8.0	5.6	7.8	5.76
	200	10.5	13.4	10.6	13.2	10.9
	400	15.4	18.2	15.0	18.0	15.4
	600	19.8	22.5	17.1	22.2	19.3
	800	23.2	26.6	22.6	26.1	22.6
	1000	26.5	29.5	25.6	29.5	25.5
10°	1	16.7	16.2	16.7	16.3	16.6
	200	20.2	19.9	20.1	20.0	20.1
	400	23.3	23.1	23.2	23.3	23.2
	600	26.1	26.0	26.1	26.3	25.9
	800	28.6	28.8	28.6	29.0	28.3
	1000	30.9	30.7	30.8	31.3	30.5
20°	1	25.7	23.8	25.7	24.1	25.6
	200	27.8	26.2	27.7	26.5	27.8
	400	29.8	28.2	29.7	28.6	29.7
	600	31.7	30.0		30.6	31.5
	800	33.5	31.7		32.3	33.1
	1000	35.5	32.9		33.8	34.6
30°	1	33.5	31.3	33.4	31.7	33.4
	200	34.7	32.5	34.6	33.0	34.5
	400	36.1	33.6	35.7	34.2	35.6
	600	37.6	34.4		35.2	36.5
	800	39.3	35.2		36.1	37.5
	1000	41.4	35.8		36.9	38.3
40°	1	41.0	39.4		39.6	40.5
	200	41.8	39.5		40.0	40.7
	400	43.0	39.5		40.2	41.1
	600	44.6	39.5		40.5	41.4
	800	46.9	39.5		40.6	41.7
	1000	49.6	39.5		40.7	42.1

TABLE IV

SPECIFIC VOLUME OF SEA WATER, (S = 35°/00)
COMPARISON TABLES (cm³/gm)

T°C	P Bars	Hydrographic Tables	Eckart	Crease	NOL	FWD
0°	1	.9726	.9726	.9727	.9726	.9725
	200	.9639	.9640	.9640	.9638	.9638
	400	.9557	.9557	.9558	.9556	.9556
	600	.9479	.9480	.9480	.9479	.9479
	800	.9406	.9407	.9407	.9406	.9406
	1000	.9337	.9338	.9338	.9337	.9337
10°	1	.9737	.9736	.9737	.9738	.9736
	200	.9654	.9654	.9654	.9654	.9653
	400	.9575	.9575	.9576	.9576	.9575
	600	.9501	.9502	.9502	.9502	.9500
	800	.9430	.9432	.9432	.9432	.9430
	1000	.9364	.9366	.9365	.9366	.9363
20°	1	.9758	.9757	.9758	.9757	.9757
	200	.9677	.9678	.9678	.9677	.9677
	400	.9601	.9601	.9602	.9601	.9600
	600	.9528	.9530	.9529	.9529	.9528
	800	.9460	.9462	.9461	.9461	.9459
	1000	.9395	.9397	.9394	.9396	.9394
30°	1	.9787	.9784	.9789	.9784	.9786
	200	.9708	.9706	.9709	.9706	.9707
	400	.9632	.9631	.9632	.9631	.9632
	600	.9561	.9560	.9560	.9560	.9560
	800	.9494	.9493	.9491	.9493	.9492
	1000	.9431	.9430	.9424	.9429	.9428
40°	1	.9823	.9819		.9819	.9722
	200	.9745	.9741		.9741	.9744
	400	.9760	.9666		.9667	.9669
	600	.9601	.9596		.9596	.9598
	800	.9535	.9529		.9529	.9530
	1000	.9473	.9466		.9466	.9466

TABLE V

COMPRESSIBILITY OF SEA WATER, $S = 35^\circ/00$ (Bars⁻¹)
COMPARISON TABLES

T°C	P Bars	Hydrographic Tables $\times 10^{-6}$	Eckart $\times 10^{-6}$	Crease $\times 10^{-6}$	NOL $\times 10^{-6}$	FWD $\times 10^{-6}$
0°	1	46.2	46.5	46.4	46.7	46.3
	200	44.0	44.0	44.0	44.1	43.9
	400	41.7	41.7	41.7	41.7	41.7
	600	39.7	39.5	39.6	39.5	39.6
	800	37.8	37.5	37.7	37.5	37.7
	1000	36.2	35.7	35.9	35.7	36.0
10°	1	44.1	44.1	44.1	44.3	44.0
	200	42.0	41.8	41.9	42.0	41.9
	400	39.9	39.7	39.9	39.8	39.9
	600	38.0	37.8	38.1	37.8	38.1
	800	36.4	36.0	36.3	36.0	36.4
	1000	34.9	34.3	34.6	34.3	34.8
20°	1	42.6	42.5	42.7	42.7	42.6
	200	40.6	40.5	40.6	40.5	40.6
	400	38.7	38.5	38.7	38.5	38.8
	600	36.9	36.7	36.7	36.7	37.0
	800	35.3	35.0	35.0	35.0	35.4
	1000	33.9	33.4	33.4	33.4	33.9
30°	1	41.8	41.6	41.9	41.7	41.7
	200	39.8	39.6	39.8	39.7	39.8
	400	37.9	37.8	38.0	37.8	38.1
	600	36.1	36.1	36.0	36.0	36.4
	800	34.4	34.4	34.4	34.4	34.8
	1000	32.9	32.9	32.8	32.8	33.4
40°	1	41.4	41.3	41.2	41.2	41.4
	200	39.3	39.3	39.3	39.3	39.5
	400	37.2	37.5	37.4	37.4	37.7
	600	35.3	35.8	35.7	35.7	36.1
	800	33.4	34.3	34.1	34.1	34.5
	1000	31.6	32.8	32.6	32.6	33.1

TABLE VI

Comparison of values of $\frac{\partial v^w}{\partial T}_{T,P,S}$ in parentheses calculated from FWD equation with those of Bradshaw and Schleicher computed from their comprehensive formula.

$$\text{Unit of } \frac{\partial v^w}{\partial T}_{T,P,S} = 10^{-6} \frac{\text{cm}^3}{\text{g}^\circ\text{C}}$$

$S = 30.50^\circ/00$

T°C	0		10		20		30	
P, bars								
1	(43)	39	(154)	154	(246)	246	(325)	324
500	(159)	158	(230)	229	(291)	290	(345)	346
1000	(235)	240	(284)	284	(324)	323	(362)	362

$S = 35.00^\circ/00$

T°C	0		10		20		30	
P, bars								
1	(56)	52	(162)	162	(250)	251	(327)	327
500	(166)	166	(234)	234	(293)	293	(346)	347
1000	(238)	244	(285)	286	(325)	325	(361)	363

$S = 39.50^\circ/00$

T°C	0		10		20		30	
P, bars								
1	(68)	65	(169)	170	(254)	256	(329)	329
500	(172)	174	(238)	239	(295)	296	(347)	348
1000	(241)	248	(287)	289	(325)	326	(361)	363

TABLE VII

Calculated values from FWD equation vs. B&S observed values for the change in the specific volume of sea water from -2° to $+2^{\circ}$. FWD values are listed in parentheses: Units are in 10^{-6} cc/gm.

P bars	201.3	401.2	601.0	800.9	1000.8
Salinity o/oo	35.004	35.005	35.004	35.002	35.006
T°C					
-2		(-269) -277.1	(-352) -356.9	(-415) -424.3	(-467) -480.5
-1	(-101) -97.5				
0	(0) 0	(0) 0	(0) 0	(0) 0	(0) 0
+2	(230) 225	(310) 310	(379) 383	(437) 445	(486) 498

REPORT OF WORKING GROUP 21
CONTINUOUS CURRENT VELOCITY MEASUREMENTS
CURRENT METER INTERCOMPARISON IN MARCH - APRIL 1970

The following representatives of members of SCOR WG 21 embarked on the Soviet Research Vessel "AKADEMIK KURCHATOV" at Dover on 7 March 1970 joining Dr. K.A. Chekotillo of the working group who was already on board and in charge of mooring operations.

W.J. Gould	N.I.O. Wormley, Surrey, England
R. Heinmiller	W.H.O.I. Woods Hole, Massachusetts, U.S.A.
D.J. Lawrence	Bedford Institute, Dartmouth, N.S., Canada
C.K. Ross	Bedford Institute, Dartmouth, N.S., Canada
W. Zenk	Institut für Meereskunde, Kiel, Germany (FRG)

Also on board were two scientists, E. Franke and G. Pluschke from the Institut für Meereskunde, Rostock-Warnemünde, GDR, who had brought, at the invitation of the Soviet Academy of Sciences, several of their type LSK recording current meters to be included in the intercomparison experiment. Mr. G. Jaffe, director of the National Oceanographic Instrumentation Center, Washington, U.S.A. also took part in the cruise at the invitation of the Soviet Academy of Sciences.

Dr. F. Webster spent a short time on board prior to the ship's sailing and was able to discuss briefly the general arrangements for the cruise and the experiment.

The chief scientist for the cruise was Dr. Ivanov-Franskevitch, and the main cruise objectives were to make a detailed survey of the currents and water structure in an area of the Southern N. Atlantic near to 15°N 35°W. The moorings for the SCOR experiment were to be in addition to those of the array already laid by the sister ship of the KURCHATOV, the "DMITRI MENDELEEV".

At an early stage during the passage to the work area, time was spent in discussion of the layout of the experiment. It was inevitable that some departures would have to be made from the provisional plan drawn up in Dublin in September 1969, but an attempt was made to keep these to a minimum. The final arrangement differed from the Dublin plan in the following respects. The depths of 25 and 300 m were changed to 50 and 200 m in order that the meters should be on heavier wire at the 200 m level and that there would not be additional risk involved by spending time attaching current meters at the 25 m level when the mooring anchor was already on the sea bed. The LSK instruments were added as shown in Table 1 but their inclusion did not in any way change the original pairings. The sampling period for the LSK was 10 minutes and that for all the other instruments 15 minutes.

As was mentioned at the Dublin meeting of the working group it is the practice on the Soviet moorings to have a continuous wire with the current meters suspended from brackets clamped to the wire. This method of suspension was to be used for all of the instruments and, since the majority of these were not designed for use in this way, there were several difficulties to be overcome. Prior to the cruise, Dr. Chekotillo sent diagrams of the Alekseev brackets to the visiting scientists, but unfortunately there was insufficient time to complete brackets for all of the meters. The brackets for the Aanderaa meters were made from stainless steel at N.I.O. but there was no time to produce suitable clamps. Non-stainless clamps were available on board, and these were welded to the brackets. Spacer bars for the lower end of the Geodyne meters were also made at N.I.O., but on board these were found to be too short, and steel sleeves were inserted into the middle of the polypropylene bars. The brackets for the Geodyne meter were the standard Alekseev design. The Braincon meter used Alekseev brackets with an additional arm welded on to offset the suspension 110 cm from the wire. The Plessey meter was used with its own suspension frame, and the LSK instrument was clamped directly to the wire.

All shackles on the SCOR moorings were seized, and the instruments were attached to the

frames with Brummel Hooks; these are in general use with the Alekseev meters and save considerable time during launch and recovery. Fifteen-kilogram steel weights were suspended beneath the Braincon and Aanderaa meters. No non-magnetic weights were available, and so one-meter stops were inserted in order to minimize the influence on the compasses.

It was agreed to arrange the meters on the wire at each depth, so that there was a constant four-meter separation of speed sensors between adjacent meters. The complete suspension arrangement for each meter was photographed prior to the experiment.

The moorings were laid on 20 and 21 March 1970 at the corners of a 5-mile square centered on 16°33'N, 32°50'W. The only incidents during the laying of these moorings were the loss of a pin from the hinge block of the Plessey meter on Mooring I and the breaking of the rotor on the Aanderaa meter on Mooring III. Spares were available for the replacement of both these items.

All the moorings carried a flashing light and radar reflector but an inspection of the moorings on 21 March showed that the mast on Mooring I had broken.

Throughout the duration of the moorings the KURCHATOV was working some distance from the mooring site, and so regular observations of the buoys were not possible. On the evening of 1 April the "ANDREI VILKITSKY" (another ship engaged in the survey) reported that all the SCOR buoys were in position. The weather during the 13 day period had been good with winds generally in the range force 3 to 5, from directions in the north-easterly quadrant.

Three moorings were recovered on 2 April (I, II and III). Mooring I which had lost its radar mast was recovered first. There was slight marine growth (goose barnacles) on the meters at the 50 m level, both on the body and fins of the instruments and also to some slight extent on the rotors. The LSK instrument at 200 m had one propellor blade missing, apparently due to corrosion, and at 1000 m there was some damage to the Plessey fin due to its having fouled the suspension frame. (It would be worthwhile to tow the meter with the damaged fin in a tank to observe its deflection from the normal position at the speeds that it would have measured during the experiment.)

On Mooring II the only damage to the instruments was that a stud had sheared on the Plessey frame, but this would in no way have influenced the data. Again there was marine growth at the 50 m level as on all the other moorings. The goose barnacles did not adhere to the speed sensors which had been treated with anti-fouling paints (Plessey, Braincon and Geodyne).

Mooring III was recovered during the early evening. This mooring and Mooring IV used a different design of surface float from Moorings I and II. These floats were a new design with the body having two diameters. When the float on Mooring III was lifted from the water it was seen that it was on the point of breaking, with the bottom layers of foam only held in place by a short piece of steel tube within the buoy. The mooring was, however, recovered without further incident.

Later in the evening a radar and searchlight search was made for Mooring IV but the mooring was not found. The search was resumed at 0900 on 3 April and after some time the buoy was sighted in its expected position. It was immediately obvious that the buoy had broken in a similar manner to III and was floating with the mast downwards, and the mooring held only on the bypass line used in lifting the moorings. Several attempts were made to grapple the buoy from the ship, but these met with no success. Finally a boat was launched, and a diver put a wire lasso around the base of the mast. The mooring was recovered by means of this lasso with no damage to any of the meters.

A preliminary investigation showed that all current meters appeared to have worked satisfactorily, except that 4 of the 12 Alekseev meters have incomplete records, and one of the 3 Braincon meters had not recorded.

TABLE 1.

DEPTH	SCOR MOORING No.			
	1	2	3	4
50 m	Aa	P	D	A
	A	A	B	G
200 m	D	B	A	D
	G			A
	A	A	Aa	P
1000 m	P	D	A	A
		Aa		
	A	A	G	B

Key Aa = Aanderaa
 A = Alekseev
 B = Braincon
 D = Warnemünde LSK
 G = Geodyne
 P = Plessey

ANNEX VI

REPORT OF SCOR WORKING GROUP 31
 SYMPOSIUM ON GEOLOGY OF THE EAST ATLANTIC CONTINENTAL MARGIN
 CAMBRIDGE, 23 - 26 March 1970

The Symposium was held at Churchill College, Cambridge, U.K. About 240 colleagues from several countries, representing universities, governmental and industrial organizations etc. were able to participate.

The principal aims of the Symposium were:

- 1) To review present knowledge and plans for investigation of the East Atlantic Continental Margin (EACM);
- 2) To identify gaps in knowledge that could be filled by coordinated national or international marine research programs.

Ten invited general lectures outlined continental margin problems. These were given by specialists in geology, geophysics, oceanography and biology, as well as economic aspects. Nineteen invited regional lectures gave reviews on topography, sediments, rocks and structures of the entire EACM. Dr. G. Giermann - UNESCO/IOC - summarized planned national and international programs. Twenty shorter regional contributions of general interest were included. 80 m² of maps and other illustrations were displayed near the lecture hall.

Accommodating the participants in Churchill College greatly facilitated personal contacts. Dr. D.H. Matthews of the Department of Geodesy and Geophysics, Cambridge, was in charge of local and technical arrangements which were conducted smoothly and efficiently.

The main lectures and some of the "Shorter regional contributions" will be published in English as soon as possible. Publication will be as a Special Report of the Institute of Geological Sciences, U.K. The price will be between £ 2 and 3. Miss Francis Delany - B.R.G.M./Paris has very kindly undertaken the task of editing the publication.

The members of Working Group 31, therefore, feel that the Symposium entirely achieved its objects and wish to express their gratitude to the sponsoring organizations: SCOR, IUGS and UNESCO. The Working Group gratefully acknowledges additional financial support given by British Petroleum, Shell and Campanie Francaise de Petrole.

Working Group 31 regards its primary functions as having been discharged, with the exception of its responsibility to edit the Symposium volume, but would like to make the following comments:

1) We recognize that investigations already undertaken on a national and international basis, as shown by the symposium, have mainly been concentrated on the continental shelf, especially off Europe, and only patchy work has been done on the slope and rise, and that knowledge of the deeper structure of the margin is limited.

We therefore recommend that national efforts be aimed at the major geographical gaps in knowledge, be extended to the slope and rise, and be intensified whenever possible. Such investigations in many cases critically depend upon international cooperation.

2) The major scientific and economic problems, as outlined in the Ponza Report and in the "Comprehensive Outline of the Scope of the Long-term and Expanded Program of Oceanic Research" of the IOC, such as (a) the genesis of continental margins, and (b) sedimentary processes on them, especially require an international interdisciplinary approach.

a) The reconstruction of the North Atlantic prior to continental separation places the poorly known structure of the Northwest African continental margin against the well studied margin of Eastern North America. In the South Atlantic the evidence for continental separation is less complex but the deep structure of neither of the opposing continental margins (e.g. South America and the Southern part of Africa) has yet been studied in sufficient detail.

b) Similarly, sedimentary processes on the margins, which have operated since the separation of the continents, have been studied only in very limited areas. This is an important problem, too, because of the latitude range, the varying oceanographic conditions, environments of deposition and the economic potential.

Therefore we recommend

that a systematic reconnaissance study of the EACM of the African continent should be made as a first step;

that systematic studies of the European continental margin already underway should be intensified and coordinated.

3) We strongly support a concept of regional working meetings to consolidate the knowledge acquired in key areas such as the Norwegian Sea, Rockall Bank, Bay of Biscay, Canary Islands/West Africa, Gulf of Guinea, Inner Walvis Ridge, and to coordinate future activities.

4) We recommend that SCOR and IUGS encourage the establishment of national committees within countries which do not have them at present, to establish and maintain contact with inter-

national programmes.

5) We recognize the significant contributions already made by commercial companies and governmental agencies to furthering the knowledge of the Atlantic margin of Africa through the partial release of their geological or geophysical data. In the interest of science, we urge those organizations which have further relevant information to make this available as far as possible for publication.

6) We note with interest the Geotraverse across the North Atlantic from Cape Hatteras to North West African planned by ESSA.

Working Group 31 believes it has fulfilled its existing terms of references, but it is willing to accept new terms if so desired.

ANNEX VII

REPORT OF SCOR WORKING GROUP 32, BIOLOGICAL DATA INVENTORIES

Report of Meeting in Washington, 7-10 April 1970

The Working Group met at the National Oceanographic Data Center in Washington, D.C. on April 7th to 10th, 1970. The following participated:

Nominated by ACMRR: Dr. Saul B. Salla, Dr. B. Zeitzschel; nominated by SCOR: Dr. J.M. Colebrook, Dr. G. Hempel (Chairman); ex-officio members: Mr. E.F. Akyuz, Dr. A.R. Picciolo, Dr. Raoul Serene.

The following observers were present: Dr. Elaine Collins (NODC, USA-Rapporteur); Mr. Reginald Creighton (Smithsonian, USA); Dr. Sidney J. Holt (Secretary, IOC); Miss Betty J. Landrum (Smithsonian, USA); Dr. James Mello (Smithsonian, USA); Mr. Ronald Moffat (WDC-A, Oceanography); Mr. William Molo (WDC-A, Oceanography).

The following terms of reference had been given for the Working Group:

1) To review the present status of biological data inventories and information retrieval in national, regional and world data centers (WDC's).

2) To propose standard forms and procedures for inventory of marine biological and related biochemical data (exclusive of commercial fishery statistics).

3) To review present procedures in cataloging reference collections of marine organisms and to consider means for speedy retrieval and exchange of information contained in such catalogs.

The Agenda as adopted by the Working Group is given in Attachment I. After the opening of the meeting by the Chairman, Dr. Austin spoke both as the host and as Chairman of the IOC Working Group on Oceanographic Data Exchange. He brought the participants up to date on the change in the policy of the U.S. National Oceanographic Data Center (USNODC) from storage of biological data to information retrieval, particularly inventories. He quoted from the Report of the 4th Meeting of the IOC Working Group on International Oceanographic Data Exchange, which had emphasized that many of the recommendations of Working Group 18 on Biological Data had never been implemented and which had stated that steps should be taken for the "setting up of a revised ACMRR/SCOR Working Group to update the recommendations of Working Group 18 and to arrange for the implementation of its proposals". He urged that the recommendations of Working Group 32 be made available to the IOC Data Exchange Working Group for its forthcoming meeting in Geneva in September, 1970.

The Chairman gave a brief history of the activities of SCOR and ACMRR in the field of biological data exchange since the establishment of WG 18 in 1964. At its meeting in 1965, WG 18 recognized the following reasons for biological data exchange: pooling of data of different origin; juxtaposition of biological and environmental data; ensuring the conservation of data by keeping centralized records; and recognition of gaps in the seasonal and/or geographical coverage in international sampling programs. During the meeting of WG 18, the discussion centered on the development of systems for international storage of biological data and on the suitability of different biological parameters for submission to data centers. Some alterations were made to the IOC Manual on Oceanographic Data Exchange. WG 18 recommended submission of biological data or of inventories thereof to national and world data centers. Major emphasis was laid on large-scale and international sampling projects.

There is an increasing need for better handling and accessibility of biological data. The number of large international projects in oceanography and of FAO field projects involving exploratory fishing and investigations in biological oceanography is growing. The amount of data being collected by continuous measuring and sampling devices is also increasing. Reference is made to the work of the ACMRR Working Party on Fish Egg and Larvae Surveys and the SCOR/IBP WG 29 on Continuous Monitoring of Biological Parameters. However, despite efforts to standardize methods, most biological data need to be accompanied by detailed information on the methods of collection and analysis. Interpretation of results is often influenced by methods and the environmental conditions during sampling. Therefore, submission of raw data to data centers cannot be satisfactory in many fields of biology. Inventories of the data holdings of operating agencies and bibliographic services would be at present the most useful means of information exchange, as they permit the retrieval of data with accompanying auxiliary information held by the collecting scientist or institution.

Review of the Present State of Biological Data Inventories

Since 1965 little progress has been made in biological data exchange in most of the national and international data centers. Although most centers do not decline to accept biological data, they do not encourage the submittance of these data by providing an adequate machinery for their processing and retrieval. The only exceptions are regional data centers such as ICES (when dealing with data on fish stocks and fishery statistics) and the USNODC.

Dr. Picciolo gave a brief history of the evolution of the USNODC with respect to biological data storage. The five biological forms produced in 1964/65 and discussed by WG 18 were never filled in by operating institutions. Emphasis, therefore, was turned to data already recorded on magnetic tape and punch card in the format most suitable to the data originator. At present, USNODC is not converting biological data to fit onto a standard format, but rather can reproduce it in the originator's format. As a result of the need for preparing an annual list of Declared National Programs for the United States, a recording and inventory form was devised called the National Marine Data Inventory (NAMDI). The form, which has now been in use for three years, was well accepted by the scientific institutions and agencies. The NAMDI forms are normally filled out soon after each cruise. The establishment of inventories of biological data appears more acceptable to marine biologists than the submittance of the data themselves to a data center. Flexibility of the NAMDI form, its on-line capability, and its use in summarizing long-range cruises on a single sheet were queried. The Working Group suggested to USNODC that, from the biological point of view, geographical information based on Marsden squares is not satisfactory and that a stronger emphasis on information on pollution might be desirable.

Mr. Akyuz reviewed the present state of FAO Fishery Data Center. Expected to be operational by 1971, it will be the repository for special fishery data, mainly assessment oriented from FAO-executed projects, regional commissions, international cooperative investigations and such other specialized data of national and international origin. The Center will essentially be responsible for compiling, processing and analyzing data for use at national or international level. Periodically, inventories of data holdings of the Center will be prepared and be widely distributed.

The data stored in the Center are supplemented by machine retrievable bibliographic infor-

mation services. These services will be available to the user at the national and international level.

Dr. Holt, while deploring the delay in the establishment of the FAO Fishery Data Center, informed the group of the intention of IBP to use the FAO Center as a depository for data collected in IBP marine projects, including comparative biological studies in grey mullets, mussels, pollution, primary production in coastal lagoons, and productivity studies in coral reefs.

The interrelations between the FAO Fishery Data Center and WDC-A were discussed. It was felt necessary that the exact scope of all specialized centers be spelled out more clearly. It was agreed that WDC's should be informed of data holdings at FAO, that non-fishery data or their inventories should be routinely forwarded to WDC-A and the experts working in UNDP, FAO and UNESCO projects should be reminded of the need for speedily submitting environmental and non-fishery marine biological data or their inventories to WDC-A. It was strongly suggested by the Working Group that IOC, when inviting a national data center to act as a regional center for an international cooperative investigation, should ensure that this center is actively seeking the biological data and related information collected during those investigations.

For its future work, the Working Group requires detailed information on the policy and current status with respect to biological data in national data centers (Recommendation 1).

Standard Forms for International Inventories of Marine Biological Data

The Working Group divided the discussion into considerations of information on an entire operation and on biological investigations in particular during the operation.

With regard to the operation itself, the need was stressed for covering in one format both discrete cruises and expeditions as well as work on fixed stations and continuous recordings over long distances of drift or steaming.

Biological and fishery studies take place predominantly in relatively small areas on the shelf. In this case, the use of Marsden squares as a reference basis is not practical. To a lesser extent the same holds for ocean wide lines of continuous recordings. The Working Group therefore considered the geographical code reported on by Mr. Creighton of the Smithsonian Institution as a very useful approach, and proposed that corner positions (in latitude on longitude) of a polygon enclosing the sampling area be used to report position. If the system is not workable, Marsden squares can be deduced from the position polygon. The Group recommended (Recommendation 2) that WDC-A run trials on the Smithsonian retrieval system for geographical areas. In addition, the Group proposed that the IHB Chart of Limits of Oceans and Seas be refined by subdividing open ocean areas into four quarters. The World IHB chart should be printed on the cover of the pads of inventory forms, possibly along with a blown-up chart of the area of major interest of the respective NODC.

The Working Group appreciated the efforts of WDC-A in the recent development of an inventory form for international use, ROSCOP, which is very similar to the USNODC NAMDI form. Taking this as a working document, the Working Group proposed amendments to the heading of the form as given in Attachment II. A clear explanation together with examples of the categories in the heading should be given on the cover. Instead of listing the scientist-in-charge in the heading of the form, the scientists responsible for the operation should sign the form together with the person who filled in the form.

With regard to the biological section of the international inventory form, the Working Group recognized the necessity for a compromise between the needs for:

- a) easy handling by the "producer", who has to fill out the forms, who might also use copies of the form as records of his activities at sea,
- b) appropriate processing and retrieval in the data centers,

c) comprehensive information to the "user" searching for the holder of relevant biological data.

It was decided that the most common types of investigation should be listed in the form (see Attachment III) and that a block of ten to fifteen lines should be left blank for filling in other investigations in any field of oceanography. To facilitate computer retrieval, a glossary of terms should be provided and, as far as possible only these terms should be entered in the blank lines. Suggestions for some biological items for the glossary are given in Attachment IV.

In addition to the physical, chemical, geological and biological sections of the ROSCOP form, a section covering studies on pollution should be established. Some suggestions for items to be included in this section are listed in Attachment V.

The Working Group would like to see the addition of the following items to the physical and chemical sections: turbidity, ammonia, extinction coefficients, and subsurface light measurements.

These changes and additions will require some rearrangement of the ROSCOP format. Writing the "programs" vertically and eliminating the maps of Marsden squares will provide an additional 31 lines without the need to reduce the spacing between lines.

The back of the form should be left blank, to be used at the discretion of the "producer", except when the NODC issuing the forms requires further information.

It was understood that the forms will be submitted to the respective NODC, DNA or regional or specialized data center which will communicate the information contained in the form (or copy of the form) to WDC's. On request the "user" will receive printouts or copies of inventories. The need for updating the inventories by follow-up information was stressed, but procedures for this follow-up have to be discussed at a later meeting of the Working Group.

Reports on Bibliographic Documentation in Marine Biology

The problems of inventories of biological data and of bibliographic documentation of marine biological publications are closely related. In many cases publications contain detailed data lists which are not otherwise easily accessible and publications are the most important result of activities listed in the primary inventories.

Dr. Collins reported on USNODC's Biological Information Retrieval System, which involves detailed indexing literature on marine ecology and the distribution of organisms. Mr. Akyuz described the plans for the development of FAO's Current Bibliography in Aquatic Sciences into a fully automated information storage and retrieval system of the literature in the field of marine and freshwater aquatic sciences as far as they are related to living organisms. While the USNODC system is entirely produced within the institution, the indexing for the FAO system will be done through FAO, several scientific institutes, and a commercial firm. The coverage in scope and number of journals searched will be wider in the FAO system than in USNODC.

Catalogs of Collections of Marine Organisms and Taxa

The Chairman and Dr. Holt described the particular problems related to inventories of the holdings of marine biological centers engaged in the sorting of material mainly collected in international expeditions. In order to familiarize the scientific community with the increasing number of marine biological sorting centers and their various activities, services, and collections, a directory should be produced containing information on topics including:

Complete address and affiliation
Staff

Reference to published description
Sources of material
Field of work
Research activities
Training activities
Contract sorting
Sorting activities
Sorting categories
Availability of reference collections
Format of data lists
Final location of samples and data
Relationship to data centers
Publications
Operation of information exchange
Capacity (manpower)

The Working Group invited the Smithsonian Oceanographic Sorting Center to take the lead in approaching the various marine biological centers to provide the necessary information so that the Working Group can prepare a directory to be published by IOC (Recommendation 4).

Inventories of the number and kind of samples received from various cruises should be reported by marine biological centers to WDC's, preferably for publication through WDC's. Those inventories should be updated at half-yearly or yearly intervals to keep track of the sorting of the material. Smithsonian Oceanographic Sorting Center was again asked to prepare drafts of inventory forms and to suggest follow-up procedures covering the holdings of sorted and unsorted samples as well as reference collections (Recommendation 5). The importance of these reference collections for the sorting and research activities of the staff and scientific visitors of marine biological centers was stressed.

Dr. Serene and Mr. Creighton introduced the Working Group to the problem of computer-based storage and retrieval of collection items and information maintained in the principal museums of natural history. The catalogs of those large collections together with smaller reference collections throughout the world are an essential reservoir of information on reference material for marine biologists. The Smithsonian Institution's Museum of Natural History demonstrated to members of the Working Group its pilot program of a computer-based catalog of specimen-related data and informed the Working Group that similar programs exist or are being developed in other museums, and that a UNESCO Working Group has suggested the use of a program of this type for the Regional Reference Collection of South East Asia.

The implementation of a uniform automated system which permits retrieval by taxa, geographic distribution, and related information is a general problem which has to be solved soon in order to make sensible use of the growing collections and of the potentialities of cross references between the segments of information attached to the various specimens. It seemed advisable to call on IUBS/ICSU for a general solution of the problem (Recommendation 6).

Other Items

The Working Group reviewed in detail the "Manual on International Oceanographic Data Exchange, Second Edition (Revised)", in order to propose amendments which might reflect the policy regarding data inventories, sorting centers, and other results of the discussion of the Working Group. A number of proposals, as listed in Attachment VI, were accepted by the Working Group for transmittal to IOC. Furthermore, it seemed advisable to update the historical remarks in Appendix 1 of the Manual to incorporate the activities of WG 32.

Dr. Zeitzschel pointed to the need for training staff members of marine biological centers (and possibly also in some of the data centers) in automated data processing. IOC under its programs for training, education, and documentation should arrange for fellowships or preferably for

training courses on a regional basis (Recommendation 7).

Dr. Mello outlined items for shipboard logging of biological measurements and samples by the onboard use of flexowriter, which might eliminate duplication of effort in labeling samples and keeping of log books by making one operation a by-product of the other. The Group agreed that such a system might provide speedier transmittal to WDC's and should be investigated further. This is in line with the request by ACMRR's Working Party on Fish Eggs and Larvae Survey, to WG 32, to develop standard forms for recording and labeling plankton catches during surveys (see Recommendation 3).

The Working Group was convinced of the need of at least one of its members taking part in the forthcoming meeting of the IOC Working Group on Data Exchange. Dr. Picciolo agreed to participate if travel funds will be covered by ACMRR or SCOR. Furthermore, the participation of Mr. Akyuz would be welcomed (Recommendation 8).

The next meeting of the Working Group should be held in the winter of 1970. Washington, D.C. seems to be the most suitable place also for the next meeting in view of the work allocated to Smithsonian Institution, WDC-A, and USNODC in developing data inventory forms, shipboard logging systems, automated catalog inventories, as well as the directory and inventories of marine biological centers and other activities related to the terms of reference of the Working Group.

The meeting was closed with the Chairman's warm thanks to the host and to the participants of the meeting.

SCOR/ACMRR Working Group 32 Recommends:

1. That the IOC take steps to provide it, as a basis for further work of the Group, with up-to-date information on the status and current mode of operation of National Oceanographic Data Centers (NODC's) and Designated National Agencies (DNA's) with respect to biological data and information. It suggests that such information be obtained by the Chairman of the IOC Working Group on Data Exchange from these centers and agencies.
2. That WDC-A run trials on the Smithsonian Global Reference Code System for geographical areas for marine inventory retrieval and report the results to the IOC Working Group on Data Exchange for its meeting in September, 1970.
3. That the terms of reference of Working Group 32 be broadened to include, at a future meeting, improvements and standardization of shipboard data logging for marine biological samples.
4. That a directory of marine biological centers engaged in sorting of samples collected in international and national cruises be published by IOC. The Working Group invites the Smithsonian Oceanographic Sorting Center to collect the necessary information from the marine biological centers for evaluation and processing by SCOR/ACMRR Working Group 32. The Smithsonian Oceanographic Sorting Center is also invited to draft a format and procedures for inventories of sample holdings in marine biological centers and report back to the Working Group.
5. That the Smithsonian Oceanographic Sorting Center, in collaboration with WDC-A, develop standardized forms to serve as a retrieval system on the data derived from the sample holdings of marine biological centers and report back to this Working Group.
6. That SCOR urge IUBS/ICSU to effect an immediate selection and adoption of a uniform automated processing system for retrieval of taxa.
7. That IOC consider the possibility of training selected staff members of the national oceanographic data centers and marine biological centers engaged in sorting samples by awarding fellowships or holding training courses on information storage and retrieval as well as data recording and processing.

- ATTACHMENT I
to Annex VII

National Oceanographic Data Center
Washington, D.C.
April 7-10, 1970

- (1) Opening by the Chairman
- (2) Address by Dr. T.S. Austin, Director, NODC and Chairman, IOC Working Group on Oceanographic Data Exchange
- (3) Introduction by the Chairman
- (4) Review of the present state of biological data inventories
- (5) Development of standard forms and procedures for international inventories of marine biological data (exclusive of commercial fishery statistics) and their publication
- (6) Reports on bibliographic documentation (information) in marine biology
- (7) Catalogs of collections of marine organisms and taxa
- (8) Other items
- (9) Consideration of recommendations, including suggestions for revisions to the IOC Manual of International Oceanographic Data Exchange

ATTACHMENT II
to Annex VII

37

SYSTEM - Enter name of data acquisition system; e.g.,
research ship, fishing vessel, buoy, dive series,
continuous plankton recorder, etc.

SYSTEM IDENTIFICATION - Enter name of ship, buoy, etc.

DATA SET IDENTIFICATION - Enter number of data sets; this
number may be an Alpha numeric name and is allocated
by collecting institute.

COLLECTING INSTITUTE - Enter full postal address of the
collecting institute.

IHB AREA - Enter number of IHB area. Chart given on cover
of pad, major oceanic areas divided into 4 quarters.

POSITIONS DELIMITING SAMPLING AREA - All in degrees and
minutes of latitude and longitude.

Fixed station - one position

Ship track - two positions

Grid or other sampling pattern - three to six
positions clockwise from any convenient
position.

A. Total number of stations

B. Total number of samples

C.Q. (for queries)

D. FD. (for final disposition
of data samples)

E. Type of format available

ATTACHMENT III to Annex VII

SCOR/ACMRR WORKING GROUP 32 ON BIOLOGICAL DATA INVENTORIES

Investigations Undertaken - Biology

B-1 Primary Production
B-2 Phytoplankton Pigments
B-3 Particulate Organic Carbon
B-4 Particulate Organic Nitrogen
B-5 Seston
B-6 Dissolved Organic Carbon
B-7 Bacteria
B-8 Other Micro Organisms
B-9 Nanoplankton
B-10 Phytoplankton
B-11 Zooplankton
B-12 Fish Eggs and Larvae
B-13 Neuston

B-14 Micronekton
B-15 Invertebrate Nekton
B-16 Pelagic Fish
B-17 Demersal Fish
B-18 Benthic Micro Organisms
B-19 Meiobenthos
B-20 Macrobenthos
B-21 Seaweed
B-22 Intratidal Animals
B-23 Aves
B-24 Mammals and Reptiles
B-25 Deep Scattering Layer
B-26 Biological Echo Surveys

SCOR/ACMRR WORKING GROUP 32
ON BIOLOGICAL DATA INVENTORIES

Glossary of Other Investigations

(Indication of type of entry expected in a glossary)

- | | |
|----------------------------------|---------------------------------|
| 1 - Biological Sound | 10 - DNA & RNA |
| 2 - Bioluminescence | 11 - Pathological Observations |
| 3 - Behavior - (specify group) | 12 - Enrichment Studies |
| 9 - Boring and Fouling Organisms | 19 - Experimental Fishing |
| 5 - Particle Size Spectrum | 15 - Abyssal Organisms |
| 6 - Total Particle Volume | 16 - Methodology |
| 8 - Vitamin Assays | 17 - Exploratory Fishing - Type |
| 7 - Amino Acid Assays | |

ATTACHMENT V
to Annex VII

SCOR/ACMRR WORKING GROUP 32
ON BIOLOGICAL DATA INVENTORIES

Pollution

- | | |
|----------------------|---------------------------------|
| P-1 Discolored Water | P-4 Floating Petroleum Residues |
| P-2 Bioassay | P-5 Chemical Pollution |
| P-3 Microbiology | P-6 Physical Pollution |

ATTACHMENT VI
to Annex VII

SCOR/ACMRR WORKING GROUP 32
ON BIOLOGICAL DATA INVENTORIES

Proposed Amendments to "IOC Manual on International Oceanographic Data Exchange, Second Edition (Revised), 1967"

Page 10, 1st column, last paragraph

"Requests furtherpossible," should read:

"Requests further that Member States take the necessary steps to submit their data and data inventories from such Declared National Programmes and other marine research activities, if so desired, to the appropriate World Data Centre as quickly as possible."

Page 12, Item 3.3, line 3

"for the exchange offrom these activities", should read:

"For the exchange of all relevant data and data inventories from these activities."

Add a second paragraph as follows:

"National or international marine biological sorting centers should be closely associated

with the WDC system and participate actively in the exchange of data and information on their holdings."

Page 13, Item 4.1.8

"Values of plant pigments.....biomass*", should read:

"Values of primary production, plant pigments, zooplankton biomass, and micro-nekton biomass.*"

Page 14, Item 5.3

"Metric unitsused", should read:

"Celsius scale, metric units and nautical miles should generally be used."

Page 15, Item 6.3

"Confirmation thatdata", should read:

"Confirmation that proposed programmes have been carried out, should be reported to the appropriate World Data Center at the close of each programme by the submission of data inventories. Further information regarding additional past cruises.....data."

Page 15, Item 6.8

Delete the entire item.

Page 17, Item 8.6, line 2

"catalogues or information sheets.....under", should read:

"Inventories of data or information sheets.....under"

Page 17, Item 8.6, line 3:

"These catalogues and information.....should", should read:

"These inventories and informationshould"

Insert a new item as 8.7:

"8.7 The national and international marine biological centers engaged in sorting samples from international and national cruises are encouraged to disseminate information regarding their holdings of samples (sorted or unsorted) and of reference collections by issuing inventories periodically."

REPORT TO UNESCO ON SCOR ACTIVITIES DURING 1969

INTRODUCTION

The contract covers the provision of scientific advice by SCOR on the oceanographic activities of UNESCO and the Intergovernmental Oceanographic Commission. To accomplish this objective, SCOR is to organize such meetings as are necessary and is to evaluate their findings as these relate to UNESCO and IOC programs and objectives.

Because of the broad scope of these programs and objectives, it is impracticable to separate out a portion of SCOR activities that is not relevant in some way. Therefore, this report covers the total program of SCOR, but draws special attention to those aspects that are most directly related to specific UNESCO or IOC programs.

More detailed information can be found in the SCOR Proceedings and in the reports of the various SCOR working groups.

MEETINGS

21-23 January	Princeton	WG 28, Air-Sea Interaction
29-31 January	Mexico City	12th Executive Meeting
26-28 February	Kiel	WG 31, East Atlantic Continental Margins
27-28 February	Fort Lauderdale	WG 10, <u>Ad hoc</u> Group on Oxygen Tables
28 March	Tokyo	Steering Committee for Joint Oceanographic Assembly
28 April - 7 May	Ponza and Rome	WG 30, Scientific Aspects of International Ocean Research
19-20 May	Wormley	WG 21, Continuous Current Velocity Measurements
26-29 August	Göteborg and Paris	13th Executive Meeting
25-27 September	Dublin	WG 31, Continuous Current Velocity Measurements
17-21 November	Miami	WG 15, Photosynthetic Radiant Energy
10-12 December	Kiel	WG 10, Oceanographic Tables and Standards

PUBLICATIONS

1. Proceedings, vol. 5, no. 1 (15 April 1969)

2. Proceedings, vol. 5, no. 2 (15 December 1969)
3. Global Ocean Research (WG 30 report) (1 June 1969)
4. SCOR Symposium on Variability in the Ocean, in Progress in Oceanography, vol. 5, (summer 1969)
5. "An intercomparison of some current meters" (WG 21 report), UNESCO Tech. Pap. Mar. Sci., No. 11
6. "Technical report of the sea trials conducted by the Working Group on Photosynthetic Radiant Energy" (WG 15 report), UNESCO Tech. Pap. Mar. Sci., No. 13

WORKING GROUPS

WG 10 Oceanographic Tables and Standards (with ICES, IAPSO and UNESCO): As a result of the Fort Lauderdale meeting (cosponsored by the U.S. National Committee on Oceanic Research) and subsequent investigations, agreement has essentially been reached on the basis for oxygen saturation values to be incorporated in the UNESCO International Oceanographic Tables. The Working Group considered this and other matters at its December meeting, the report on which is not yet available.

WG 15 Photosynthetic Radiant Energy (with IAPSO and UNESCO): The report of the first sea trials (Pub. No. 6) was completed under a separate UNESCO contract with Mr. Tyler, chairman of the group. The November meeting was devoted to preparation for more elaborate trials to be held aboard R/V DISCOVERER in April 1970.

WG 21 Continuous Current Velocity Measurements (with IAPSO and UNESCO): As a result of the May meeting, the final report on the 1967 field trials was completed (Pub. No. 5). During the September meeting (see Proceedings 5 (2), Annex III), consideration was given to a further intercomparison experiment to include the widely used Alekseev meters. It is hoped that this can be arranged in early 1970.

WG 23 Zooplankton Laboratory Methods (with UNESCO): The work of this group is being carried out by Dr. H. Steedman (University of Bath) with the assistance of the National Environmental Research Council (UK) and the Royal Society, and by the Smithsonian Institution. Dr. Steedman has made periodic visits to the Smithsonian Institution with support from SCOR and UNESCO. A contract has been written between UNESCO and Dr. Steedman for preparation of a handbook on methods of zooplankton preservation.

WG 24 Estimation of Primary Production under Special Conditions (with IBP/PM): An interim report has been published (see Proceedings 5 (1), Annex IV). A second meeting will be held when relevant investigations being conducted by members of the group are further advanced.

WG 25 Nutrient Chemistry: The work of this group is being continued by the ICES Sub-Committee on Chemical Analysis of Sea Water which is organizing the proposed international intercalibration experiment. Standard samples to be used in the experiment have been prepared under the supervision of Professor Ken Sugawara who has published a CSK report "On the preparation of CSK standards for marine nutrient analysis" with financial assistance from SCOR and the Ministry of Education, Japan. Participating laboratories have been identified in a number of countries, and the first consignment of samples have been shipped.

WG 27 Deep Sea Tides (with IAPSO and UNESCO): With support from SCOR and the Institute of Geophysics and Planetary Physics (La Jolla), Dr. Cartwright worked with Professor Munk on the development of methods for analysis of tidal records of long duration from the open ocean. The following publication resulted:

Cartwright, D., W. Munk and B. Zetler (1969). Pelagic tidal measurements. EOS, 50 (7): 472-477.

WG 28 Air-Sea Interaction (with IAMAP and IAPSO): Extracts from the report of the January meeting have been published (see Proceedings, 5 (2), Annex IV).

WG 29 Continuous Monitoring in Biological Oceanography (with ACMRR, UNESCO and IBP/PM): Membership of this group has been completed and work has been initiated through correspondence.

WG 30 Scientific Aspects of International Ocean Research (with ACMRR and WMO): After the meeting of this group, the report was prepared in English and distributed by SCOR; translations in French, Spanish and Russian were prepared by the cooperating agencies. The report was a basis of discussions by the IOC Working Group on the Long Term and Expanded Program of Oceanic Research and by the IOC VI Session, and has been transmitted by IOC to the UN Secretary General.

WG 31 East Atlantic Continental Margins (with UNESCO and IUGS): At the February meeting of this group, plans were initiated for a symposium to be held in Churchill College, University of Cambridge on 23-26 March 1970. Invited lecturers have been selected, and the third circular was issued by the end of the year.

WG 32 Biological Data Inventories (with ACMRR): Membership of this group has been completed and work has been initiated through correspondence. The first meeting is scheduled for 20-24 April 1970.

WG 33 Phytoplankton Methods (with IBP/PM): Membership of this group has been completed and work has been initiated through correspondence.

WG 34 Oceanographic Basis of Ocean Monitoring and Prediction Systems: It is anticipated that organization of this group, established at the 13th Executive Meeting, will be completed during the first quarter of 1970.

DISCUSSION OF WORKING GROUPS

All of the SCOR Working Groups contribute more or less directly to UNESCO or IOC programs. Major emphasis is given in the UNESCO contract to the standardization and intercalibration of oceanographic methods and techniques, and six of the active groups deal directly with such problems. In the field of biology, there is consideration of zooplankton laboratory methods, estimation of primary production under special conditions, and quantitative phytoplankton methods. An international intercalibration of methods of nutrient analysis is being organized in cooperation with ICES. Methods for measuring irradiance are being developed, and intercomparisons of current measuring systems are being organized. Perfection of methods is at the heart of successful cooperative investigation and of international data exchange, and it is likely that further SCOR groups on methods will be established as scientists recognize the need in specific fields.

International data exchange is a responsibility of IOC, and in response to a request from the IOC working group on data exchange, a group has been established with the assistance of ACMRR to consider problems of biological data inventory. Data exchange is also dependent on the availability of suitable tables, and SCOR is assisting in the development and selection of such tables for publication by UNESCO.

Five SCOR working groups deal with problems relevant to IGOSS, a major program of IOC. Monitoring of the velocity field will benefit from the work of the group concerned with continuous current velocity measurements and from the development of bottom pressure gauges by members

of the group on deep-sea tides. Design of the system will depend on considerations of air-sea interaction, and will ultimately benefit from the review of methods for monitoring biological parameters. A new group will consider the design of a critical experiment basic to design of the ultimate ocean monitoring and prediction system.

Another major IOC effort is the so-called Expanded Program. Proposals for this Program have emphasized the desirability of a cooperative investigation of the east Atlantic continental margin, a matter under review by a SCOR working group. A major contribution to planning of the Expanded Program was made by the working group that met in Ponza and Rome in the spring of 1969.

These working groups not only devote their attention to problems of direct interest to UNESCO and IOC, but also serve to involve significant numbers of scientists in international activities. For example, during 1969 twelve working groups were active and included 100 scientists from 18 countries. This wide-spread participation strengthens scientific support of, and interest in, UNESCO and IOC programs.

OTHER MATTERS RELATED TO UNESCO/IOC

1. During 1969, SCOR sent representatives to the following meetings dealing with problems of direct interest to IOC:

IOBC Consultative Committee - Dr. Humphrey

International Group for Scientific Coordination of the Cooperative Investigations in the Mediterranean - Professors Stommel and Vaissiere

Group of Experts on Scientific Aspects of Marine Pollution - Professor Postma

IOC Working Group on the Long Term and Expanded Program - Professor Wooster

IOC 9th and 10th Bureau, VI Session - Professor Wooster and Dr. Voigt

IOC Group of Experts on Ocean Variability - Dr. Voigt

UNESCO/IOC Ad Hoc Group on Marine Geological/Geophysical Data Inventory - Professor Wooster

2. UNESCO matters which have been considered by the Executive Committee and on which recommendations have been submitted to UNESCO include the following:

a. International Directory of Marine Scientists

b. Proposed publication of collected reprints on the results of deep ocean floor investigations.

c. Advisory Committee on International Plankton Centers .

3. After discussions with the officers of ACMRR, a joint SCOR/ACMRR statement on development of the Expanded Program was prepared and submitted to the IOC VI Session. Comments on the IOC draft "Guide for Cooperative Investigations" were also formulated.

4. Because of their relation to UNESCO and IOC interests, SCOR co-sponsored and supported financially the following scientific meetings:

Petrology of Igneous and Metamorphic Rocks of the Ocean Floor - Royal Society,
London, 12-14 November 1969

Inland Seas - Upper Mantle Committee, Madrid, 4-6 September 1969

Physical Variability in the North Atlantic - International Council for the Exploration
of the Sea, Dublin, 25-27 September 1969.

JOINT OCEANOGRAPHIC ASSEMBLY

In 1967, IAPSO proposed that consideration be given to forming an International Union of Marine Sciences. One consequence of this proposal was that IAPSO, SCOR, IABO and CMG decided to convene a Joint Oceanographic Assembly in September 1970. The Japan Science Council and the Oceanographic Society of Japan have made it possible for the meeting to be held in Tokyo.

SCOR organized a meeting in Tokyo, 28 March 1969, to discuss organization of the Assembly. A preliminary program was developed, and an International Steering Committee was established. Subsequently, First and Second Announcements were printed and distributed by SCOR. During the IOC VI Session, a resolution (VI-21) was adopted commending plans for the Assembly and urging members and international organizations to provide the necessary financial support.

The Assembly is important to IOC for two reasons. First, after the Second International Oceanographic Congress, it was generally agreed that in the future, such congresses should preferably be organized by nongovernmental scientific bodies, with financial support from inter-governmental ones. Thus, in Resolution VI-21, IOC decided "to consider the Joint Oceanographic Assembly as a desirable approach to the problem of organizing world oceanographic meetings of broad scope, such as the International Oceanographic Congresses in the past".

In the second place, the Assembly will consider the desirability of an International Union of Marine Sciences and of alternative ways of improving the arrangements for marine science within ICSU. These arrangements have a direct bearing on the means whereby scientific advice is provided to IOC. If, as seems likely, the alternative is selected of broadening SCOR to give it greater responsibilities for integrating the activities of the various ICSU bodies concerned with marine science, SCOR will be in a better position to serve as a scientific advisory body to IOC.

GENERAL COMMENTS

Since the initiation of IOC and the major expansion of UNESCO oceanographic activities in 1961, SCOR has devoted an ever increasing portion of its energies and resources to matters directly related to UNESCO or IOC programs. Critics of this practice have suggested that SCOR has, in the process, become a captive of UNESCO/IOC and no longer gives adequate attention to the more general problems of marine science.

It is of course true that the efforts of SCOR are limited by manpower and funds, so that the more attention paid to UNESCO/IOC problems, the less can be given to other matters. On the other hand, there are only certain types of problems that can be effectively tackled by SCOR and its working groups. The present set of problems has been selected for action through the initiative of SCOR National Committees as well as of UNESCO/IOC, and is believed to represent a proper mix of scientific questions, of broad interest to marine scientists as well as of specific interest to UNESCO/IOC. As SCOR develops closer links with other bodies concerned with various aspects of marine science, as envisioned in the proposals for a broadened SCOR, there will be an increased capability to give proper attention to the broad scope of problems of interest to marine scientists.

Until recently, the efforts of SCOR have been principally limited by the availability of scientists willing to participate in working groups and other activities. In 1970, it seems likely that funds will also limit these efforts. The true cost of SCOR's work is not reflected in the budget. For example, sea trials such as those conducted by Working Groups 15 and 21 entail ship operating expenses of the order of hundreds of thousands of dollars. The budget does not show the salaries of participating scientists, contributed by their employers, nor the contributions of national committees or of cooperating organizations, especially UNESCO, to a number of special projects.

Of the sums actually spent by SCOR in 1969, less than one third have been provided by UNESCO, more than 40% have come from national committees, and the rest have been drawn from reserve. Despite the increasing requirements of IOC and the inflationary increases in costs, the amount of the UNESCO contract has remained constant during recent years, and no increase has been provided for 1970.

In 1970, further sea trials by Working Groups 15 and 21, and organization of the Joint Oceanographic Assembly will leave only limited funds for other activities of SCOR. By 1971, it is anticipated that an increased schedule of national contributions will be in effect. It is also hoped that UNESCO will provide a significant increase in the amount of its contract, in recognition of the importance of SCOR's role in the expanding programs of UNESCO and IOC.

ANNEX IX

UNITED NATIONS GENERAL ASSEMBLY XXIV SESSION RESOLUTION ADOPTED BY THE GENERAL ASSEMBLY 2560 (XXIV). Marine science

The General Assembly,

Recalling the considerations set forth in its resolution 2172 (XXI) of 6 December 1966,

Having noted with appreciation the report of the Secretary-General entitled "Marine science and technology: survey and proposals",¹ submitted in response to resolution 2172 (XXI),

Noting also the note by the Secretary-General on the establishment of an intersecretariat committee,² which arose out of the suggestion of the Secretary-General in his report on marine science and technology,

Recognizing the growing awareness of the importance of the oceans to the progress of mankind,

Aware of the need to obtain more information concerning the oceans and their resources,

Recalling the request in its resolution 2414 (XXIII) of 17 December 1968 that the Secretary-General present a comprehensive outline of the scope of a long-term and expanded programme of oceanic exploration and research, of which the international decade of ocean exploration will be an important element, taking into account the recommendations of the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization and in co-operation with other interested international organizations,

Recalling also the request in its resolution 2467 D (XXIII) of 21 December 1968 that the Intergovernmental Oceanographic Commission intensify its activities in the scientific field, co-operate with the Secretary-General in the preparation of the comprehensive outline, and report to the General Assembly at its twenty-fourth session on progress made in the implementation of that resolution,

Noting Economic and Social Council resolution 1470 (XLVII) of 17 November 1969, by which the Council transmitted the comprehensive outline to the General Assembly,

1. Notes with appreciation the comprehensive outline of the scope of a long-term and expanded programme of oceanic exploration and research, of which the international decade of ocean exploration will be an important element, forwarded by the Chairman of the Intergovernmen-

tal Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization to the Secretary-General and annexed to a note by the Secretary-General on this subject;³

2. Reaffirms its conviction that any exploration or research carried out under the long-term and expanded programme will be exclusively scientific in nature and that all such activities falling under the national jurisdiction of a State shall be subject to the previous consent of such State, in accordance with international law;

3. Requests the United Nations Educational, Scientific and Cultural Organization and its Intergovernmental Oceanographic Commission to keep that programme up to date and consider its implementation in appropriate stages, in co-operation with other interested organizations, in particular the United Nations, the Food and Agriculture Organization of the United Nations, the World Meteorological Organization and the Inter-Governmental Maritime Consultative Organization;

4. Urges Member States to co-operate with the Intergovernmental Oceanographic Commission in the implementation of that programme in appropriate stages;

5. Commends the close working relations that have developed between the Intergovernmental Oceanographic Commission and the United Nations, the Food and Agriculture Organization of the United Nations, the World Meteorological Organization and the Inter-Governmental Maritime Consultative Organization, including the establishment of the Intersecretariat Committee on Scientific Programmes relating to Oceanography, which consists of representatives of the latter organizations, to further, in consultation with the Chairman of the Intergovernmental Oceanographic Commission, the common aspects of the work of the Intergovernmental Oceanographic Commission and those organizations;

6. Requests the Intergovernmental Oceanographic Commission and the organizations mentioned in paragraph 5 above to continue to work closely together for the furtherance of their common objectives, within their own terms of reference;

7. Requests the Secretary-General to report to the Economic and Social Council on the progress made in the updating and implementation of that programme.

¹ E/4487 and Corr.1-6 and Add.1 and 2.

² A/C.2/247.

³ A/7750.

1832nd plenary meeting,
13 December 1969.

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2566 (XXIV). Promoting effective measures for the prevention and control of marine pollution

The General Assembly,

Recalling its resolution 2414 (XXIII) of 17 December 1968, in which it requested the Secretary-General to report to the General Assembly at its twenty-fifth session, inter alia, on the progress achieved by Member States and organizations concerned in promoting the adoption of effective international agreements on the prevention and control of marine pollution as might be necessary,

Recalling also its resolution 2467 B (XXIII) of 21 December 1968 on the prevention of marine pollution which might result from exploration and exploitation of the resources of the sea-bed and ocean floor,

Noting that a joint group of experts on the scientific aspects of marine pollution has been established by the Food and Agriculture Organization of the United Nations, the United Nations Educational, Scientific and Cultural Organization, the World Meteorological Organization and the

Inter-Governmental Maritime Consultative Organization to give advice to these agencies on this subject,

Taking into account the "Comprehensive outline of the scope of the long-term and expanded programme of oceanic exploration and research"¹ providing for a series of scientific studies which would review the state of the ocean and its resources as regards pollution, and forecast long-term trends to assist Governments individually and collectively to take the steps required to counteract its effects,

Bearing in mind arrangements made by the Food and Agriculture Organization of the United Nations for the holding of a technical conference on marine pollution and its effects on living resources and fishing to be held at Rome in December 1970,

Recalling its resolution 2398 (XXIII) of 3 December 1968 on the convening in 1972 of a United Nations Conference on the Human Environment and the report of the Secretary-General on problems of the human environment² which, inter alia, stresses the problems relating to marine pollution,

Noting resolution A.176 (VI) on marine pollution, adopted by the Assembly of the Inter-Governmental Maritime Consultative Organization on 21 October 1969, calling for an international conference in 1973 for the purpose of preparing a suitable international agreement for placing restraints on the contamination of the sea, land and air by ships and other vessels or equipment operating in the marine environment,

Considering that in spite of the sustained efforts being made at present, many aspects of marine pollution have not yet been dealt with or are not being fully covered, and that additional agreements on this subject may be required,

1. Requests the Secretary-General, in co-operation with the specialized agencies and intergovernmental organizations concerned, to complement reports and studies under preparation, with special reference to the forthcoming United Nations Conference on the Human Environment, by:

(a) A review of harmful chemical substances, radio-active materials and other noxious agents and waste which may dangerously affect man's health and his economic and cultural activities in the marine environment and coastal areas;

(b) A review of national activities and activities of specialized agencies and inter-governmental organizations dealing with prevention and control of marine pollution including suggestions for more comprehensive action and improved co-ordination in this field;

(c) Seeking the views of Member States on the desirability and feasibility of an international treaty or treaties on the subject;

2. Requests the Secretary-General to report to the Economic and Social Council and to the Preparatory Committee for the United Nations Conference on the Human Environment, as appropriate in the framework of the preparations for the Conference.

¹ A/7750, annex.

² E/4667.

1832nd plenary meeting,
13 December 1969.

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2574 (XXIV). Question of the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interests of mankind

A

The General Assembly,

Recalling its resolutions 2340 (XXII) of 18 December 1967 and 2467 (XXIII) of 21 December 1968,

Having regard for the fact that the problems relating to the high seas, territorial waters, contiguous zones, the continental shelf, the superjacent waters, and the sea-bed and ocean floor beyond the limits of national jurisdiction, are closely linked together,

Considering that the definition of the continental shelf contained in the Convention on the Continental Shelf of 29 April 1958¹ does not define with sufficient precision the limits of the area over which a coastal State exercises sovereign rights for the purpose of exploration and exploitation of natural resources, and that customary international law on the subject is inconclusive,

Noting that developing technology is making the entire sea-bed and ocean floor progressively accessible and exploitable for scientific, economic, military and other purposes,

Affirming that there exists an area of the sea-bed and ocean floor and the subsoil thereof which lies beyond the limits of national jurisdiction,

Affirming further that this area should be used exclusively for peaceful purposes and its resources utilized for the benefit of all mankind,

Convinced of the urgent necessity of preserving this area from encroachment or appropriation by any State, inconsistent with the common interest of mankind,

Noting that the establishment of an equitable international regime for this area would facilitate the task of determining the limits of the area to which that regime is to apply,

Noting further the continuing efforts of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction to elaborate such a regime in accordance with paragraph 2 (a) of resolution 2467 A (XXIII),

1. Requests the Secretary-General to ascertain the views of Member States on the desirability of convening at an early date a conference on the law of the sea to review the regimes of the high seas, the continental shelf, the territorial sea and contiguous zone, fishing and conservation of the living resources of the high seas, particularly in order to arrive at a clear, precise and internationally accepted definition of the area of the sea-bed and ocean floor which lies beyond the limits of national jurisdiction, in the light of the international regime to be established for that area;

2. Requests the Secretary-General to report on the results of his consultations to the General Assembly at its twenty-fifth session.

¹ United Nations, Treaty Series, vol. 499 (1964), No. 7302.

1833rd plenary meeting,
15 December 1969.

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The General Assembly,
Recalling its resolutions 2340 (XXII) of 18 December 1967 and 2467 (XXIII) of 21 December 1968,

Having considered the report of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction,²

Expressing its satisfaction to the International Atomic Energy Agency, the International Labour Organisation, the Food and Agriculture Organization of the United Nations, the United Nations Educational, Scientific and Cultural Organization and its Intergovernmental Oceanographic Commission, and to the Inter-Governmental Maritime Consultative Organization for their participation in and contribution to the Committee's work, as well as to the Secretary-General for his assistance,

1. Takes note with appreciation of the report of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction;

2. Invites the Committee to consider further the questions entrusted to it under General Assembly resolution 2467 (XXIII) with a view to formulating recommendations on these questions, in the light of the reports and studies to be made available to it and taking into account the views expressed in the General Assembly at its twenty-fourth session;

3. Notes with interest the synthesis at the end of the report of the Legal Sub-Committee,³ which reflects the extent of the work done in the formulation of principles designed to promote international co-operation in the exploration and use of the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction and ensure the exploitation of their resources for the benefit of mankind, irrespective of the geographical location of States, taking into account the special interests and needs of the developing countries, whether land-locked or coastal;

4. Requests the Committee to expedite its work of preparing a comprehensive and balanced statement of these principles and to submit a draft declaration to the General Assembly at its twenty-fifth session;

5. Takes note of the suggestions contained in the report of the Economic and Technical Sub-Committee;⁴

6. Requests the Committee to formulate recommendations regarding the economic and technical conditions and the rules for the exploitation of the resources of this area in the context of the regime to be set up.

² Official Records of the General Assembly, Twenty-fourth Session, Supplement No. 22 (A/7622 and Corr.1); A/7622/Add.1.

³ Ibid., part two.

⁴ Ibid., part three.

1833rd plenary meeting,
15 December 1969.

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The General Assembly,
Recalling its resolution 2467 (XXIII) of 21 December 1968,
Noting with appreciation the report of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction,⁵

Noting with satisfaction the study on international machinery prepared by the Secretary-General, which is annexed to that report,⁶

Bearing in mind the recommendation of the Committee that the Secretary-General should be requested to continue this study in depth,

1. Requests the Secretary-General to prepare a further study on various types of international machinery, particularly a study covering in depth the status, structure, functions and powers of an international machinery, having jurisdiction over the peaceful uses of the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction, including the power to regulate, co-ordinate, supervise and control all activities relating to the exploration and exploitation of their resources, for the benefit of mankind as a whole, irrespective of the geographical location of States, taking into account the special interests and needs of the developing countries, whether land-locked or coastal;

2. Requests the Secretary-General to submit his report thereon to the Committee on Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction for consideration during one of its sessions in 1970;

3. Calls upon the Committee to submit a report on this question to the General Assembly at its twenty-fifth session.

⁵ Ibid., Supplement No. 22 (A/7622 and Corr.1); A/7622/Add.1.

⁶ Ibid., annex II.

1833rd plenary meeting,
15 December 1969.

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The General Assembly,

Recalling its resolution 2467 A (XXIII) of 21 December 1968 to the effect that the exploitation of the resources of the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction, should be carried out for the benefit of mankind as a whole, irrespective of the geographical location of States, taking into account the special interests and needs of the developing countries,

Convinced that it is essential, for the achievement of this purpose, that such activities be carried out under an international regime, including appropriate international machinery,

Noting that this matter is under consideration by the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor beyond the Limits of National Jurisdiction,

Recalling its resolution 2340 (XXII) of 18 December 1967 on the importance of preserving the sea-bed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction, from actions and uses which might be detrimental to the common interests of mankind,

Declares that, pending the establishment of the aforementioned international regime:

(a) States and persons, physical or juridical, are bound to refrain from all activities of exploitation of the resources of the area of the sea-bed and ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction;

(b) No claim to any part of that area or its resources shall be recognized.

1833rd plenary meeting,
15 December 1969.

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The General Assembly,

Having considered the final report of the Enlarged Committee for Programme and Co-ordination,¹

Noting that the Enlarged Committee was unable in the time available to give thorough consideration to a proposal for more systematic co-ordination of continuing activities of the organizations in the United Nations system relating to the seas and oceans,

Aware of the complexity of the co-ordination of existing international activities with regard to marine science and its applications, and that the field of marine science is only one aspect of the existing activities of the organizations in the United Nations system relating to the seas and oceans,

Noting that use by States of the marine environment is rapidly becoming intensified and diversified,

Concerned that present international machinery may not permit a prompt, effective and flexible response to existing and emerging needs of States Members of the United Nations,

Recognizing that, in order to avoid the overlapping and duplication of programmes and gaps in competence, a full review of the existing activities of the organizations in the United Nations system relating to the seas and oceans may be urgently required,

1. Requests the Economic and Social Council, at its organizational session in January 1970, to consider instructing the Committee for Programme and Co-ordination, after reconstitution, to examine the need for a comprehensive review of existing activities of the United Nations system relating to the seas and oceans in the light of present and emerging needs of Member States, with a view to making the Committee's recommendations available to the Council at its forty-ninth session;

2. Requests the Secretary-General to assist the Committee for Programme and Co-ordination in the fulfillment of this task;

3. Invites the specialized agencies and the intergovernmental bodies concerned to extend their full co-operation and assistance to the Committee for Programme and Co-ordination.

¹ E/4748 and Corr.1.

1834th plenary meeting,
15 December 1969.

ANNEX X

MEETINGS OF SCOR AND ASSOCIATED ORGANIZATIONS IN 1970

28 June - 3 July	Malta	Center for the Study of Democratic Institutions: Pacem in maribus
7 - 10 July	Aarhus	ICES/FAO/ICNAF Symposium on Stock and Recruitment
7 - 10 July	Paris	IOC Group of Experts on Ocean Variability: 2nd meeting
11 - 13 July	Paris	IOC IGOSS Executive Coordination Meeting

20 - 24 July	Munich	IAG/IAPSO Symposium on Coastal Geodesy
13 - 25 September	Tokyo	SCOR/IAPSO/IABO/CMG Joint Oceanographic Assembly "The Ocean World": SCOR 10th General Meeting; business meetings of IAPSO, IABO, CMG
22 - 25 September	Geneva	IOC WG on Oceanographic Data Exchange: 5th meeting
24 - 29 September	Madrid	ICSU General Assembly
28 - 29 September	Rome	IBP/IUBS International Symposium on the Ecological Bases for Environmental Management
28 Sept. - 1 Oct.	Tokyo	IOC: 2nd CSK Symposium
28 Sept. - 2 Oct.	Rome	SCIBP: 4th meeting
28 Sept. - 7 Oct.	Copenhagen	ICES: 58th statutory meeting
2 - 3 October	Tokyo	IOC CSK ICG: 7th meeting
7 - 14 October	Rome	ACMRR: 6th meeting
9 November	Geneva	IOC IGOSS Working Committee: 3rd meeting
9 - 12 November	Nanaimo	SCOR WG 24 Estimation of Primary Production under Special Conditions: 2nd meeting
10 - 13 November	Geneva	IOC IGOSS Working Committee and WMO Executive Committee Panel on Meteorological Aspects of Ocean Affairs: 3rd joint meeting
16 - 21 November	Paris	IOC Bureau with Consultative Council: 12th Meeting
23 - 26 November	Brussels	IOC ICG for the Southern Ocean: 1st meeting
30 Nov. - 3 Dec.	Paris	IOC WG on Mutual Assistance and WG on Training and Education
1 - 3 December	Kingston, R.I.	SCOR WG 33 Phytoplankton Methods: 1st meeting
9 - 18 December	Rome	FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing

ABBREVIATIONS

ACMRR	Advisory Committee on Marine Resources Research (of FAO)
ACOMR	Advisory Committee on Oceanic Meteorological Research (of FAO)
BRGM	Bureau de Recherches Geologiques et Minieres
CINECA	Cooperative Investigation of the North East Central Atlantic
CMG	Commission on Marine Geology (of IUGS)
CSIR	Cooperative Science and Industrial Research
CSK	Cooperative Study of the Kuroshio
DNA	Designated National Agencies
EACM	East Atlantic Continental Margin
EAS	Transactions of the American Geophysical Union
ESSA	Environmental Science Services Administration
FAGS	Federation of Astronomical and Geophysical Services
FAO	Food and Agriculture Organization of the United Nations
FRG	Federal Republic of Germany
GDR	German Democratic Republic
IABO	International Association of Biological Oceanography (of IUGS)
IAG	International Association of Geodesy
IAMAP	International Association of Meteorology and Atmospheric Physics (of IUGG)
IAPSO	International Association for the Physical Sciences of the Ocean (of IUGG)
IBP/PM	International Biological Programme/Productivity Marine
ICES	International Council for the Exploration of the Sea
ICG	International Cooperative Group
ICNAF	International Commission for Northwest Atlantic Fisheries
ICSPRO	Inter-Secretariat Committee on Scientific Programs Relating to Oceanography
ICSU	International Council of Scientific Unions
IGOSS	Integrated Global Ocean Station System (of IOC)
IGU	International Geographical Union
IHP	International Hydrographic Bureau
IMOS	Inventory of Marine Observations
IOBC	Indian Ocean Biological Center
IOC	Intergovernmental Oceanographic Commission
IUB	International Union of Biochemistry
IUBS	International Union of Biological Sciences
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences
IUPAP	International Union of Pure and Applied Physics
IUPS	International Union of Physiological Sciences
£	English Pound
LEPOR	Long-Term and Expanded Program of Oceanic Research
MODE	Mid-Ocean Dynamics Experiment
NAMDI	National Marine Data Inventory
NAS	National Academy of Sciences, Washington, D.C.
NIO	National Institute of Oceanography
NODC	National Oceanographic Data Center
NS	Nova Scotia
PSMSL	Permanent Service for Mean Sea Level
ROSCOP	Report of Observation/Samples Collected by Oceanographic Programs
SCAR	Scientific Committee on Antarctic Research
SCIBP	Special Committee for the International Biological Programme
SCOR	Scientific Committee on Oceanic Research
UAR	United Arab Republic
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
USNODC	United States National Oceanographic Data Center
WDC-A	World Data Center - Oceanography, Washington, D.C.
WG	Working Group
WHOI	Woods Hole Oceanographic Institution, Woods Hole, Massachusetts
WMO	World Meteorological Organization